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UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 827

Contribution from the Bureau of Animal Industry
JOHN R. MOHLER, Chief

Washington, D. C. May 26, 1921

THE CUT-OVER PINE LANDS OF THE SOUTH FOR BEEF-CATTLE PRODUCTION

By

F. W. FARLEY and S. W. GREENE
Animal Husbandry Division, Bureau of Animal Industry

CONTENTS

Page
- Extent of the Cut-Over Lands . . . 2
- Survey of the Cut-Over Lands . . . 5
  - Objects and Plan of Procedure . . . 5
- Status of the Beef-Cattle Industry . . . 6
  - Number and Value of Cattle . . . 6
  - Size and Quality of Cattle . . . 8
  - Work Accomplished in Improving Native Cattle . . . 11
  - Native Cattle for Foundation Herds . . . 12
- Adaptation of Cut-Over Lands for Beef Cattle . . . 13
  - Climate . . . 14
  - Area in Farms and Grazing Lands . . . 14
  - Soils and Topography . . . 15
  - Ownership of Lands and Size of Holdings . . . 16
  - Improvement of Cattle . . . 19
  - Pastures . . . 20
  - Winter Feeds . . . 34
  - Concentrated Feeds . . . 38
  - Silage Crops . . . 42
  - Recommendations for Winter Feeding . . . 43
  - Buildings and Shelter . . . 46
  - Diseases and Pests . . . 47
  - Water Supply . . . 48
  - Markets . . . 49
- Experimental Work of Immediate Importance . . . 49

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CONTENTS.

Page.
Extent of the cut-over lands 2
Survey of the cut-over lands 5
  Objects and plan of procedure 5
Status of the beef-cattle industry 6
  Number and value of cattle 6
  Size and quality of cattle 8
  Work accomplished in improving native cattle 11
  Native cattle for foundation herds 12
Adaptation of cut-over lands for beef cattle 13
  Climate 14
  Area in farms and grazing lands 14
  Soils and topography 15
Adaptation of cut-over lands for beef cattle—Continued.
  Ownership of lands and size of holdings 16
  Improvement of cattle 19
  Pastures 20
  Winter feeds 34
  Concentrated feeds 38
  Silage crops 42
  Recommendations for winter feeding 43
  Buildings and shelter 46
  Diseases and pests 47
  Water supply 48
  Markets 49
Experimental work of immediate importance 49

In the summer of 1917 the Bureau of Animal Industry, United States Department of Agriculture, in cooperation with the Mississippi experiment station, established at Collins, Miss., a branch beef-cattle experiment station to determine practical methods to follow in growing beef on cut-over pine lands. Soon after the station was established and plans for the work were put under way it was realized that, before further experiments were conducted, more definite information should be obtained concerning the resources and possibilities for beef-cattle production on cut-over pine lands.

S. W. Greene, who was in charge of the work at Collins, was detailed by the Bureau of Animal Industry to make a survey of the "Piney Woods" region and collect information along these lines. The data collected by Mr. Greene are included in this publication.

Later, the station was transferred from Collins to McNeill, Miss., where the work is to be conducted on a broader scale than was possible at Collins.

EXTENT OF THE CUT-OVER LANDS.

The cut-over pine lands of the South lie within the area known as the Coastal Plain. This section is spoken of locally as the "Piney Woods." It includes the southeastern portion of South Carolina, most of Florida, the southern parts of Georgia, Alabama, and Mississippi, the central and northern parts of Louisiana, and parts of southeastern Texas and of southern Arkansas. At present the total area is estimated at 100,000,000 acres and is being increased about 10,000,000 acres annually, as additional land is cut over. One company alone in Louisiana requires a cut of 80 acres daily to supply its mills. It is estimated that ultimately the area of the cut-over lands will reach 250,000,000 acres.

A bare statement of figures does not readily present the vastness of such an area. When comparisons are made the cut-over lands appear as a veritable empire. The area represents an acreage more than half that of the State of Texas, or equal to the combined acreage of Georgia, Alabama, and Mississippi. Much of all this great area is unused and unproductive.

The sandy soil of sedimentary origin which constitutes the Coastal Plain is the natural habitat of the long-leaf yellow pine (*Pinus palustris*), which once covered the territory with a heavy growth to the exclusion of practically all other timber, except on the alluvial land along streams, which is forested with hardwood trees. This species of pine is of first importance to the naval-stores industry, as it is the main species in the United States that is tapped for turpentine.

Long-leaf pine also makes a very high grade of lumber, and since the late nineties lumbering has superseded all other industries in the section mentioned. In 1909 the cut of southern yellow pine was 36.6 per cent and in 1913 it was 38.7 per cent of the entire cut of all species of the country.[1]

Because of the immense scale of lumbering operations the land has been rapidly denuded of the timber, and as practically all timbered lands were in the hands of lumbermen whose interest was in the timber, the lands remained as the woods crews left them—covered with stumps and strewn with crowns, unmerchantable logs, and small timber. Little thought was given to their future development as agricultural or grazing lands. In other words, the cut-over condition of the lands is a by-product of lumbering. With the end

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[1] Bureau of Crop Estimates and Forest Service, U. S. Department of Agriculture.

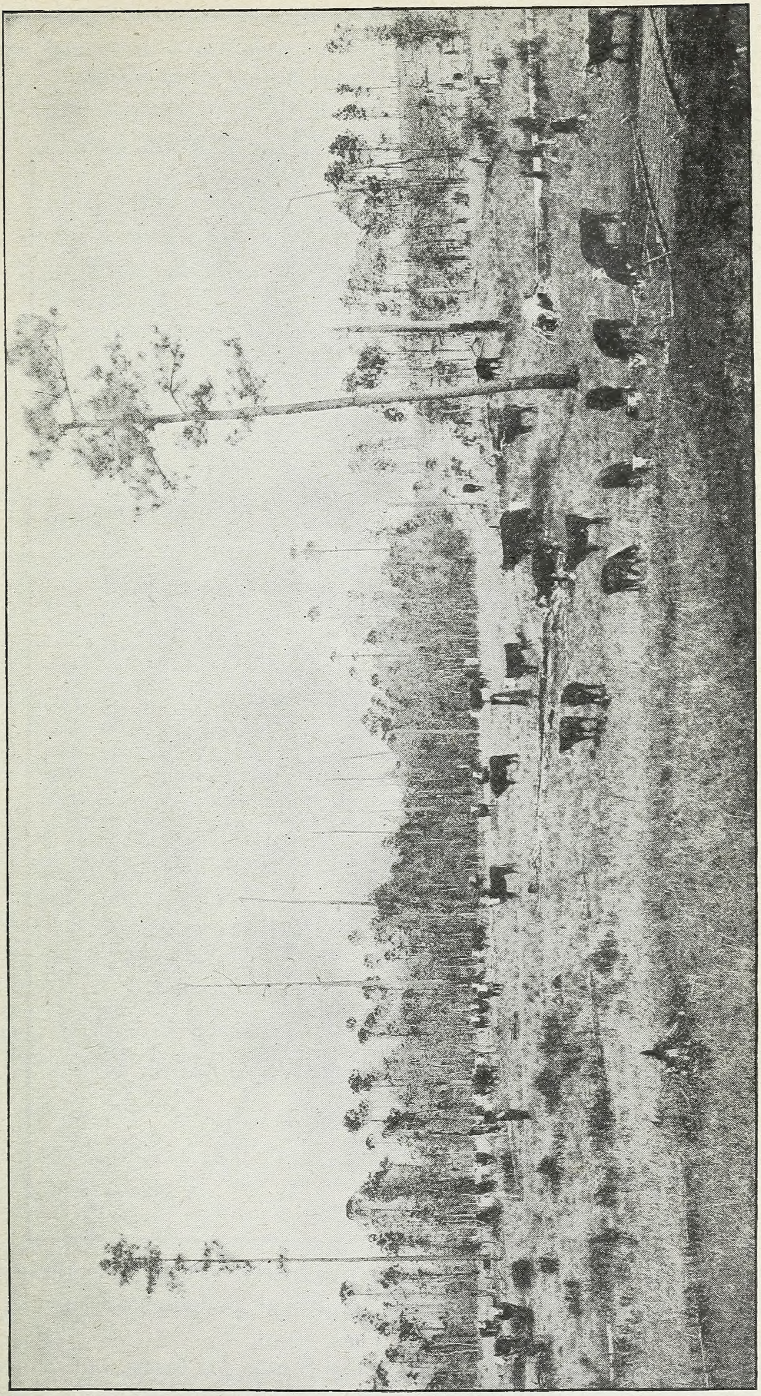

FIG. 1.—Native pasture typical of the cut-over pine lands of the South.

of lumbering operations in sight, with increasing taxes on the nonproductive land, and with no market to assimilate the oversupply, the owner of such lands was presented with an acute problem which resolved itself into the question of letting the land revert to the State for taxes, putting the land to some productive use, or developing it until it would be desirable for agricultural purposes and could be sold.

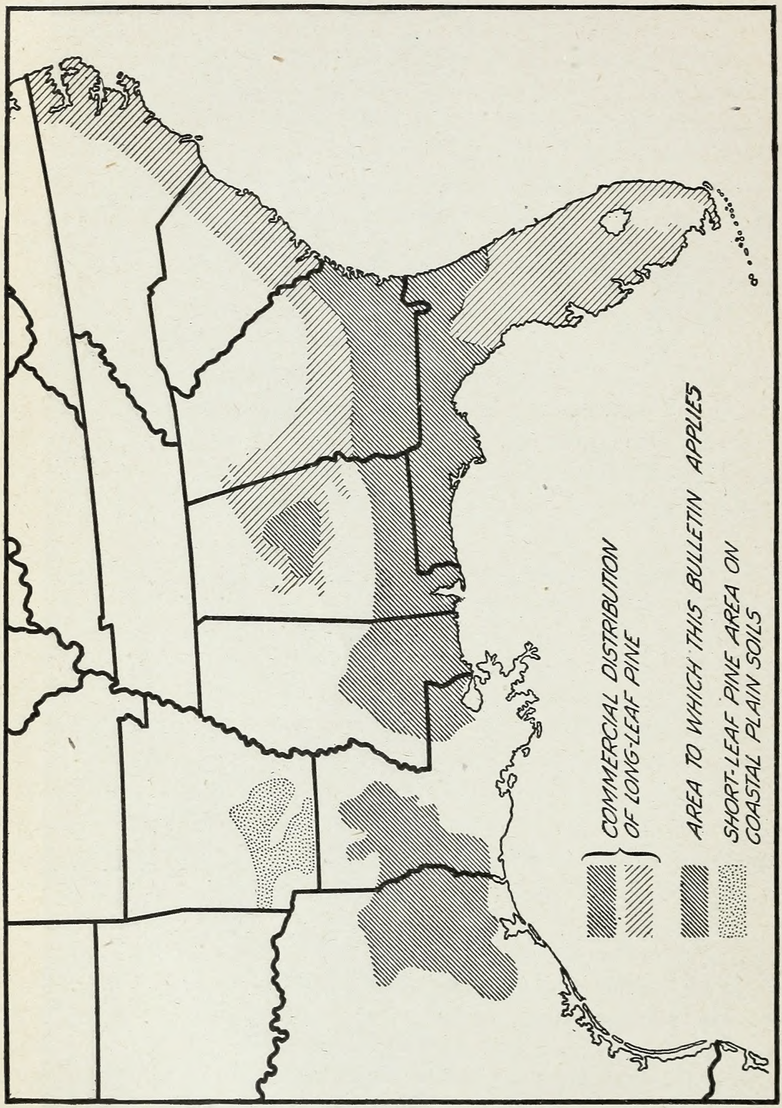
COMMERCIAL DISTRIBUTION OF LONG-LEAF PINE
AREA TO WHICH THIS BULLETIN APPLIES
SHORT-LEAF PINE AREA ON COASTAL PLAIN SOILS

Fig. 2.—General distribution of long-leaf pine, showing approximately the area covered in this bulletin.

In many cases land did revert to the States for taxes, but lumbermen began to realize that large portions of their lands had an agricultural value. They also realized that their lands required development either to make them productive or to demonstrate their value and place them in a form so that they would be assimilated as farms on a large scale. However, considerable raw cut-over land is being sold to settlers.

Increasing interest in the development of cut-over lands was responsible for the "Cut-Over Land Conference of the South," which was held at New Orleans, La., in April, 1917. More than 400 large landowners and agricultural experts, both State and Federal, were present at the meeting. That the utilization of cut-over lands in the near future depended largely upon the use of grazing animals was the consensus of opinion. The meeting also brought out the fact that very little definite information was available concerning the possibilities of the region for cattle production.

The map, figure 2, shows the area discussed in this report. The shaded portions represent the approximate commercial distribution of the long-leaf yellow pine. The heavily shaded portion indicates the area in which the larger part of the land is unused cut-over land and the region to which this report particularly applies. The shaded portion in Arkansas is forested with shortleaf pine but lies within the Coastal Plain, and the soils and conditions are similar to the upper Coastal Plain region east of the Mississippi River.

SURVEY OF THE CUT-OVER LANDS.

OBJECTS AND PLAN OF PROCEDURE.

The survey of the Piney Woods region, herein reported, was made to secure first-hand information as to the resources and possibilities of the cut-over pine lands of the South for beef-cattle production and was undertaken with the following points in view:

1. To determine the status of the beef-cattle industry.
2. To determine the adaptation of the region for the production of beef cattle.
3. To determine what recommendations for improvement of present conditions should be made.
4. To determine what experimental work with beef cattle is needed.

A study was made of available literature pertaining to the Piney Woods, including soils, crops, grasses, forage, and experimental work with beef cattle. The agricultural colleges were then visited and with their cooperation an itinerary was mapped out for trips of inspection to the farms of the principal cattlemen, lumber companies, and development associations in the Piney Woods of Arkansas, Louisiana, Mississippi, Alabama, Georgia, and Florida. Typical undeveloped tracts and virgin forests were also visited in the different States. In addition questionnaires were mailed to all county agents, all owners of pure-bred beef cattle, so far as lists were available, and all the larger lumber companies.

STATUS OF THE BEEF-CATTLE INDUSTRY.

NUMBER AND VALUE OF CATTLE.

Table 1 shows the number of cattle other than milk cows for 1910, and for the last 4 years in the 6 States included in this report.

TABLE 1.—*Number and value of cattle other than milk cows in States with large areas of Piney Woods.*[1]

State.	Number Jan. 1—				Census, Apr. 15, 1910.	Value per head Jan. 1, 1920.
	1920	1919	1918	1917		
Georgia	771,000	763,000	727,000	686,000	666,000	$27.20
Florida	945,000	936,000	891,000	865,000	611,000	27.30
Alabama	842,000	851,000	760,000	534,000	534,000	22.90
Mississippi	716,000	708,000	644,000	575,000	580,000	23.50
Louisiana	725,000	690,000	600,000	525,000	510,000	29.30
Arkansas	691,000	678,000	640,000	560,000	599,000	24.40
Total	4,690,000	4,626,000	4,262,000	3,745,000	3,500,000	[2] 25.77

[1] Figures for 1910 are taken from the Census report; other figures from Bureau of Crop Estimates, U. S. Department of Agriculture.

[2] Average.

This table presents some interesting points relative to the size and growth of the cattle industry and the values of cattle. The figures given are for the entire States, but the points brought out by the table are pertinent as applied to the Piney Woods sections. It will be noticed that the increase in the number of cattle during the last three years has been rapid as compared with the total increase from 1910 to 1916. The year 1910 marked the beginning of greater interest in the beef-cattle industry. About this time the menace of the boll weevil to the one-crop system of cotton farming turned attention to live stock. The growth from that time has been steady. The growth has been more rapid in the last four years because more area has been freed from ticks, and higher prices have been paid for cattle.

Although the cattle industry is growing rapidly, the number of cattle is proportionately far below that of other cattle-producing States and is only a fraction of the possibilities.

On January 1, 1920, the number of cattle in the States named was about one-ninth the total number for the United States, but their value was only one-sixteenth of the total value. The average value of cattle per head for the six States at that time was $25.77, while the average value per head for the six leading cattle States, viz, Texas, Nebraska, Iowa, Kansas, Missouri, and Minnesota, was $44.27. The difference in price indicates the difference in size and quality.

The fact that the Piney Woods region produces cattle of such relatively small value is due to a number of factors, the chief ones being the character of the agriculture, the occupation of lumbering, and the cattle tick.

The character of the agriculture of the Piney Woods region has had considerable effect on the number of cattle produced. Like other portions of the South, the section followed largely a one-crop system, growing cotton for a cash crop, and neglecting the raising of winter feeds and the saving of hay. Clearing the land of stumps was the main difficulty in preparing land for cultivation, and such small areas as were cleared were planted to cotton, sugar cane, peanuts, and sweet potatoes, grass being fought as a deadly enemy.

From the middle nineties until the present time the lumber industry has overshadowed all others; considerable numbers of the people turned from farming to lumbering as an occupation, and farms were often neglected. Lumbering did not diminish the area of grazing lands, but the quality of the ranges deteriorated. With the removal of the virgin pine a thick undergrowth of scrub oak or young pine, depending upon the kind of soil, rapidly covered the land; " down " timber left from logging covered much of the ground and fires became more destructive, destroying most of the " switch " cane, on which the cattle depended for winter grazing, and preventing the spread of desirable pasture plants. The chief demand for cattle during this time was for work oxen.

As large tracts of the cut-over sections are owned by lumber syndicates and sawmill companies which have been interested chiefly in the timber value of their lands, efforts have been made in relatively few instances toward agricultural development. The cut-over lands were left open and were used for grazing the native cattle, but the system was not one that would induce large operations or encourage the entrance of outside cattlemen.

The cattle tick has not only been responsible for large losses of cattle, but the quality of the cattle produced in ticky territory and the necessary restrictions placed on their shipment have affected the market for cattle from these sections to such an extent that there was no inducement for greater production. Before the Revolutionary War, restrictions were placed on southern cattle being driven into the Northern States, as it had become known that they carried a disease which was fatal to northern cattle and which afterwards became known as Texas fever.

Even under such adverse conditions considerable numbers of cattle were maintained and in many cases they furnished the chief source of income. Prior to the building of the sawmills, the Piney Woods region was frequently referred to as the "cow country." With the disappearance of the sawmills in cut-over sections, interest in farming has revived during the last few years, and following the eradication of the cattle tick there has been a rapid increase in the number of cattle.

Widespread use of the velvet bean for winter forage and feed has done more to increase the number of cattle than any other factor except tick eradication. In many sections cattle have been increased solely for the purpose of utilizing the enormous crops of velvet beans, which could be marketed in no other way.

SIZE AND QUALITY OF CATTLE.

The native Piney Woods cattle are of very inferior quality, small in size, of poor conformation, and are what the feeder would term "cold blooded," as they do not respond readily to feed. Although these cattle are compact and show a good dressing percentage when fattened and slaughtered, the weight is too much forward, and there is a small percentage of valuable cuts. Mature cows average about 400 or 500 pounds, and steers from 3 to 5 years old average from 600 to 750 pounds.

The following table shows the average live weight of cattle slaughtered at Jacksonville, Fla., New Orleans, La., and East St. Louis, Ill., during 1918:

TABLE 2.—*Average weight of cattle slaughtered at three markets in 1918.*

Class of cattle.	Jacksonville, Fla.	New Orleans, La.	East St. Louis, Ill.
	Pounds.	*Pounds.*	*Pounds.*
Canners	462	525	730
Cutters	462	600	745
Mature steers	(1)	750	1,000

(1) Very few mature native steers slaughtered and no separate record kept.

Table 2 furnishes an interesting comparison of the weights of Florida cattle and those of cattle of the Piney Woods farther west with cattle received at East St. Louis, one of the larger markets for cattle from a large territory. Canners and cutters at Jacksonville, Fla., were nearly 100 pounds lighter than at New Orleans and more than 200 pounds lighter than at East St. Louis. Few native steers were slaughtered at Jacksonville, but they were at least 300 to 350 pounds lighter than those at East St. Louis, or 150 pounds lighter than at New Orleans.

The greatly increased interest in better cattle is shown by the fact that out of 65 head of pure-bred Hereford cattle sold at public auction at the Kansas City Royal Show in 1918, 18 head were from Piney Woods herds. That most of the cattle went to northern breeding herds, whence the original stock came, is evidence of their merit.

The theory, which has had wide circulation in the South, that the small size and poor quality of native cattle in general are due to lack of feed and care and not to heredity or breeding, is contrary to the established laws of heredity. Such a theory if given general credence would greatly retard the improvement of the cattle through the introduction of improved blood.

The foundation stock of the native cattle was probably early Spanish importations and the original cattle themselves were small. They have remained small and of inferior quality, principally because of failure to make good selection and to introduce better blood.

Proper use of feed and care is no doubt a very important factor in the development of the individual, but the size and quality acquired through feeding are not transmitted to the offspring and no continued improvement can be made by feed and care alone without selection and the use of improved blood. However, the fact that no continued improvement can be made in the size or quality of cattle through the influence of feed and care alone is not an argument for not caring for the native cattle, as feed is the most important factor in developing the individual. Certainly the native cattle may be made to weigh much more by proper feeding, but can not be made to approach the weight of improved cattle raised under the same conditions.

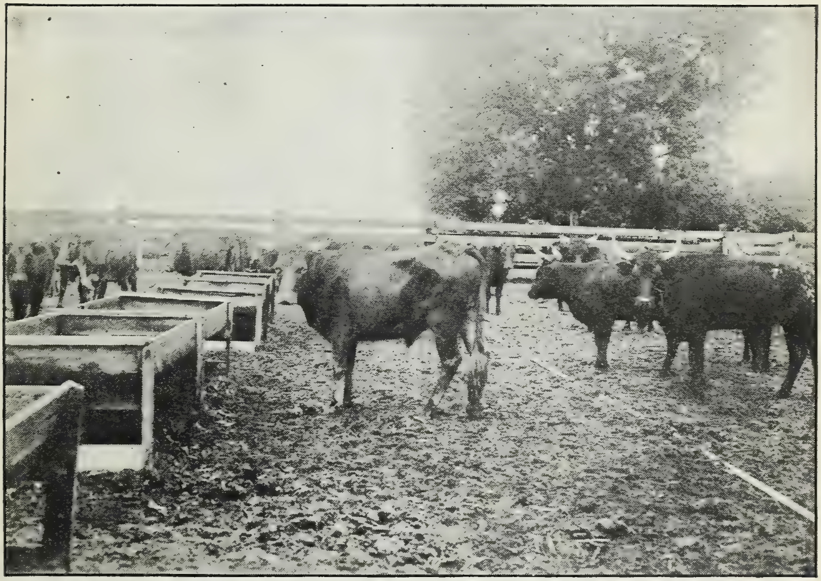

FIG. 3.—Native "Piney Woods" steers in the feed lot.

The argument often advanced that pure-bred animals put under the same conditions as the native cattle will rapidly deteriorate into scrubs is not true, so far as heredity is concerned, for they will transmit the power to respond to feed and will far surpass the scrub if given proper feed and care. In other words, the pure-bred animal has been developed through long-continued breeding and selection to intensify the quality of responding to plentiful feed and converting it into meat of the most value, and that quality has become a fixed characteristic.

If a pure-bred or grade animal is kept under the same conditions to which the native cattle have been subjected, all the inherent advantage of responding to feed will be lost in that individual for the time being, as it will be subjected to an environment to which it is entirely unsuited and to which the native cattle have adapted themselves through generation after generation of natural selection and the "survival of the fittest." It is necessary that the native cattle should be hardy animals, and were it not for the powerful influence exerted by heredity to maintain the offspring true to the ancestors and not to the individual, the strain of native cattle would have run out long ago because of the ravages of the cattle tick, lack of feed, breeding immature animals, and inbreeding.

Prior to the Civil War large plantation owners took pride in their cattle and brought in pure-bred bulls, mostly Devons and Shorthorns. The steers with Devon blood were prized as work oxen, on account of their endurance and easy-keeping qualities. Traces of the Devon blood may still be seen in many of the native cattle. Brahman blood was also introduced along the coast, and some native cows are found showing Brahman characteristics. For a good many years very little improved beef blood was introduced. Considerable numbers of Jersey bulls were brought in, however, and when crossed with the native cows produced animals inferior to the native for beef purposes.

The cattle tick has had a far-reaching effect on the native cattle. Cattle heavily infested with ticks have been lowered in vigor and vitality to such an extent that they have not been able fully to utilize the grazing. When infested with ticks through the summer the cattle are in poor condition to stand the hard period of the winter months when grazing is scarce. This is especially true of young animals which are badly handicapped during the first 2 years of growth. It is not uncommon in a ticky country to see a yearling calf so emaciated from ticks as to go down when driven and be unable to stand even when assisted to its feet.

Further, with no provisions for winter feed, native cattle are forced to go through a period of semistarvation each year and during that time they lose a large part of the gains made in the more favorable grazing season. This system is particularly hard on young cattle during their first 2 winters, and they become so stunted that it requires 1 or 2 years longer to reach mature size than it would if they were supplied feed for continuous growth. A growing animal subjected to such annual periods of semistarvation takes much longer to reach mature size. The experience may be so rigorous as seriously to affect its health and vigor. Then, again, this period of semistarvation comes at a time when cows are heavy with calf, and as a result calves are not so strong when dropped as they would be if their dams were in good condition.

Cows are left to wean their calves and it is not uncommon to see a cow suckling a yearling. No separation is made of heifers and bulls, and as a result the former are allowed to "take up" and drop calves when under age and undersized. Breeding immature heifers seriously retards their growth and final development, and there is considerable evidence that the continuation of such a practice will eventually reduce the size of the animals in a herd. Under such a system there has been continual inbreeding, but the comparative effect of inbreeding on size and quality no doubt has been overemphasized in many cases. Inbreeding tends to intensify bad points, but it also intensifies desirable points, and possibly the intensification of the hardiness of the animals has offset any bad effects under natural selection.

"Topping" or selecting the best cattle for sale instead of culling has tended to decrease size and quality. This practice has been followed especially in Florida, where for a great many years the bulls were "topped" for export to Cuba for fighting purposes. It has had a very marked effect on the native cattle of Florida, as they are noticeably smaller and of a quality inferior to those of other sections of the Piney Woods to the north and west.

WORK ACCOMPLISHED IN IMPROVING NATIVE CATTLE.

The greatest step leading to the improvement of the native cattle has been the eradication of the cattle tick. In ticky country the importation of a pure-bred bull from tick-free territory is almost sure to be followed by death from tick fever, on exposure to native cattle or open pasture. Following the local county and State-wide dipping of cattle, the danger of death from tick fever is practically eliminated. The eradication of the ticks has also greatly improved the thrift of the native cattle and allows better utilization of the pastures. The cattle tick has been a great handicap and the advantages of its eradication could be enumerated at great length. It is sufficient to say that the tick is disappearing rapidly and the beneficial results are being demonstrated and recognized.

Although the value of pure-bred bulls for improving the native cattle was generally recognized, their number has increased slowly.

Few men in each county owned sufficient numbers of cows to induce them to purchase a bull and only the most progressive men have been purchasers.

Before the introduction of pure-bred bulls, improvement by selection was usually a negative quantity, the cow herds being topped for market. Where grading up with good bulls is now being practiced, however, the selection of the cow herd has been given consideration and the herds are being culled each year instead of topped.

With more attention to farming, methods of management have been improved, especially in the matter of providing winter feed and forage. Since the introduction of velvet beans practically all farmers are providing winter forage. Better management in other respects usually has resulted from the introduction of better blood.

NATIVE CATTLE FOR FOUNDATION HERDS.

Men familiar with the early western ranges state that the Piney Woods cows are equal to or superior to the native Texas cows, from which a very high grade of cattle has been evolved. That the native cows are well adapted to grading up through the use of pure-bred bulls has been demonstrated in every case where a good bull has been used.

The improvement is very marked in the first cross as to uniformity in both color and type. There is a marked change in the width, depth, and size of bone, the first cross resulting in an animal being closer to the ground and more nearly the beef type in every respect. The hardiness of the native cattle has become fixed to such a degree that there is little doubt that this quality is transmitted to some extent to grade animals produced by crossing the cows with pure-bred bulls.

In Louisiana 500 head of first-cross "weaners" in one bunch were observed. These calves were from pure-bred Hereford bulls out of native cows of all colors. The calves were as uniform in color and type as could be desired and they had the general appearance of beef animals. The same results from smaller numbers were observed in every section of the Piney Woods.

In Alabama one breeder has been grading up by the use of a pure-bred bull for the last 15 years and his herd of 178 head of grade Herefords now ranges from one-half to fifteen-sixteenths pure bred. Practically half of his herd could hardly be distinguished from pure breds. The records of these cattle have been followed closely. The yearlings now produced from high-grade cows weigh 200 pounds more than native yearlings under the same conditions as to pasture and feed. The increase in weight has been brought about by the continued use of a pure-bred sire and the proper selection and culling of females.

A Florida breeder has been grading up the native cows with pure-bred Shorthorn bulls for 15 years and his present herd is uniformly good. In his herd he has the original first-cross cow, called Old Blue, and her granddaughters and great-granddaughters, and the last could not be picked out from his pure-bred heifers.

Like results have been obtained by other breeders with sufficient numbers of cattle to leave no doubt as to the value of the native cow for foundation herds. With proper selection and 10 to 15 per cent culling each year, native cows should be a valuable asset for increasing the herds.

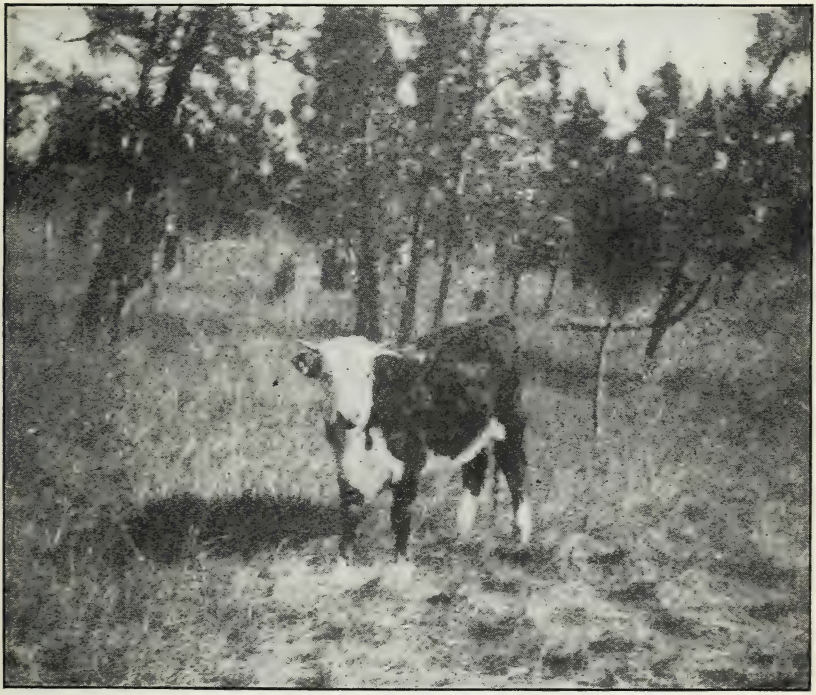

Fig. 4.—A grade heifer three crosses removed from a "Piney Woods" cow. Note the "growthy" appearance, the scale, and size of bone.

ADAPTATION OF CUT-OVER LANDS FOR BEEF CATTLE.

For the economic production of beef cattle, a country must furnish abundant grazing, ample water supply, soils capable of producing cheap winter feeds or forage, and convenient transportation to markets. These requirements may be readily fulfilled in the Piney Woods, yet, as pointed out later, immediate results must not be expected. The region needs general development and even then cattle owners must understand local problems in handling their stock and growing feed before they can expect best results.

CLIMATE.

In addition to the factors mentioned, the Piney Woods region has the advantage of a mild climate with long summers and short, mild winters. The average date of the last killing frost in the spring is March 10, and the first killing frost in the fall is after November 11. This gives a growing season of from 220 to 240 days. The annual rainfall is heavy, seldom falling below 50 inches in any section and often reaching as high as 80 inches in some sections. Such a climate permits an abundant growth of pasture plants and offers a grazing season of 8 or 9 months.

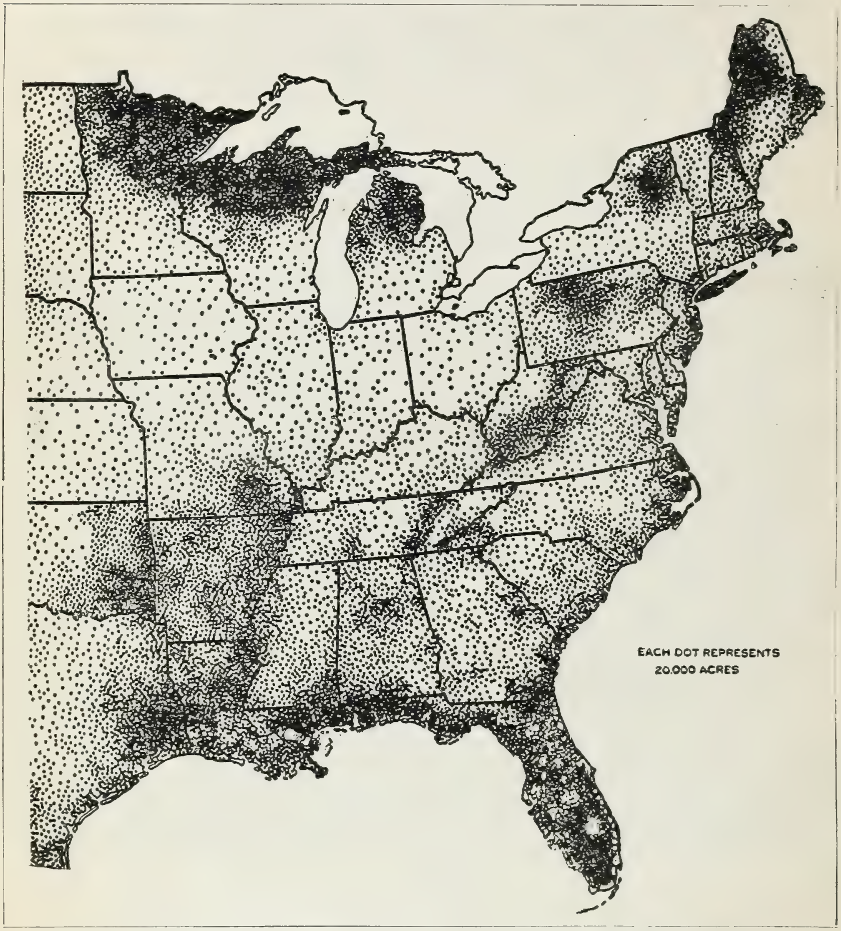

FIG. 5.—Land not in farms, according to the census of 1910.

AREA IN FARMS AND GRAZING LANDS.

Figure 5, compiled from the census of 1910, shows the land not in farms in the United States. In the States under discussion the black dots, each representing 20,000 acres, form a dark shading which follows closely the cut-over pine sections. Only 10 to 20 per cent of the section is in farms; and 80 to 90 per cent is range land, a large proportion of which has had the timber cut off. With such a small proportion of the land in farms it is evident that the production of feed must be very limited in proportion to the area of grazing.

SOILS AND TOPOGRAPHY.

The regions discussed in this report lie within the great Coastal Plain, which borders the Atlantic Ocean and the Gulf of Mexico. This plain lies to the south of the highland areas of the Piedmont Plateau and the Appalachian Mountain and Ozark regions. It rises gradually from sea level inland, attaining along the interior border an elevation of from 400 to 600 feet. Its surface is prevailingly smooth, but there is a range from the nearly level " flatwoods " along the coast to the rolling and hilly lands bordering the southern extension of the Appalachian Mountain region. The drainage varies from poor near the coast to very thorough or excessive in the more rolling portions and in the areas of deep, loose, sandy soil.

Sandy soils predominate; but there are important belts of clay land and silt loam, and many traversing streams include over their first bottoms and second bottoms strips of sandy, silty, and clay lands.

In physical composition (texture) the sandy soils are of two principal kinds, namely, sandy soils with clay or sandy clay subsoils, and deep, loose sands having no clay within 3 feet or more of the surface. The former largely predominate over the region as a whole; but there are belts, such as the Sand Hills and the Florida Flatwoods, in which deep sands occur over wide areas practically to the exclusion of soils with clay subsoils.

Near the coast the soils are light, sandy loams, with sandy subsoils. In the upland hill regions the soils become quite heavy and are subject to severe erosion if not kept covered with vegetation during winter.

The sandy soils along the coast and in the flatwoods are not well adapted to the production of forage or feed crops unless they are heavily fertilized. Drainage in the flatwoods to make them productive is usually necessary. The moist flatwoods, however, are well adapted to carpet grass and " switch " cane, and the grazing is comparatively good.

The heavier soils are better adapted to growing forage and feed crops. They are often deficient in nitrogen and phosphorus and require fertilizing, but under proper management produce good yields of feed crops and are well adapted to growing pastures. The heavier soils are in the rolling hill lands, much of which is too steep for cultivation. The topography of this land fits it particularly for grazing. In practically all sections there is bottom land and level land enough to produce a sufficient quantity of feed for wintering cattle and in many sections to grow feed for finishing cattle for market.

On the basis of topographic, soil, or drainage differences the Coastal Plain includes a number of well-defined subdivisions or subordinate regions. Detailed descriptions of the soils of the Piney Woods area, also soil-survey maps, may be obtained from the Bureau of Soils, U. S. Department of Agriculture.

SELECTION AND MANAGEMENT OF SOILS.

In the selection of a location for a cattle ranch the adaptability of the soils for growing feed and improving pastures should be an important consideration. Some locations are so rough that they must be kept in grass to prevent washing and are not suitable for cultivation. While these lands may provide excellent grazing, to be desirable they should have level or bottom lands in connection to permit the growing of winter feeds. Many locations which are adapted to cultivation so far as topography is concerned have a sandy subsoil and require heavy fertilization to produce feed crops. The fertility of these lands rapidly leaches away under cultivation, though much of the sandy land furnishes good natural grazing.

The lands which can not be converted into farming lands should be developed less intensively and in larger tracts than the more valuable tracts. Pasture improvement should be by natural rather than by intensive methods and only such feed crops grown as are necessary to carry cattle through winter and permit marketing them off grass.

The level and rolling lands with clay subsoils are well adapted for intensive pasture improvement and the production of feed crops. The fertility of these lands may be built up rapidly by the use of legumes and animal manures, and feed may be grown to fatten all the cattle produced. These lands should be converted gradually into smaller farms and their future value as such will justify the gradual improvement while being used as cattle range.

OWNERSHIP OF LANDS AND SIZE OF HOLDINGS.

This great body of undeveloped lands is now largely owned or controlled by lumber syndicates and large sawmill companies whose holdings vary from a few thousand acres to half a million. The holdings of the lumbermen who answered questionnaires on the subject averaged 29,000 acres. The owners were interested primarily in cutting off the merchantable timber and not in the future development of the lands. However, some have undertaken very creditable projects in developing their land. The lands covered with stumps, unmerchantable logs, and crowns left from logging are not attractive to buyers. The amount of land taken up by the native people as needed for farming is not extensive. Colonizing schemes have failed in most instances and the cheap land has not attracted the cattlemen. Sales of large tracts of cut-over land have frequently been made to land-sales companies whose chief interest was to make a handsome profit by resale in smaller parcels.

While the ownership of lands in large tracts has retarded development in the past, at present it is an advantage to the building of a cattle industry, as large tracts of cheap land can be bought and a wide choice can be made of lands particularly adapted to individual uses.

RECOMMENDATIONS.

Because of the newness of the cattle business along improved lines and the small number of practical demonstrations it is difficult to give recommendations based on well-established practice. There are many points, however, which should receive the attention of the present owners of these lands, beginners in the cattle business, and outsiders who are contemplating the purchase of land but who are not familiar with the region.

The immediate conversion of the great body of cut-over lands into small farms is not advisable even if it were possible. A redistribution of the ownership of the lands and their use for agricultural purposes is desirable, but the process should be gradual. The present use and development of the lands as a whole must be in large tracts consisting of several thousand acres. The lands are not improved to an extent to make them desirable as farming lands, and not until they are improved and their possibilities demonstrated will they find a ready sale at a fair price. The utilization of these nonproductive lands for reforestation and grazing purposes is the only logical solution in the near future.

Colonization has been a failure except in rare instances, and always will be so long as land is sold at high prices in small tracts to clerks, conductors, mechanics, and other city people who are allured by brilliant literature describing the possibilities of the country in an impracticable manner. The capital of such people is usually taken up by the initial purchase, and they are left without sufficient capital to develop the land sufficiently to make a living income. What the region needs is farmers with sufficient finances or backing to establish permanent homes and develop the land. The sale of unimproved land should be on easy terms, and the improvements made by the settler should furnish a satisfactory margin of security. As a matter of safety the settler should be advised as to farming methods that promise success.

The sale of small farms, except in colonies, is a slow process for the owner of large tracts, and such sales are necessarily at higher prices. From the purchaser's standpoint, small farms of from 40 to 60 acres are not large enough for a farmer to make a living. The sale of medium-sized tracts of land on reasonable terms to farmers who wish to increase their operations should be encouraged.

Lands that are not yielding enough to pay taxes at present may either be turned to raising cattle at a profit and at the same time improved so they may be marketed at a fair price as they come into demand for farming land, or be reforested, either by the present owner or by the State or the National Government.

The development of the land by the lumberman presents two phases. It may be developed with the idea of making a permanent business of farming and cattle raising, or partly developed as a demonstration of its possibilities with the idea of its future sale. In either case cattle raising must be considered as a business in itself and given intelligent and close study, the same as any other business. If the owner can not give the business this attention himself he may employ a competent manager who, preferably, should have a financial interest.

Individual farms operated for the diversion of the owner may well be show places, but ranches run for profit and demonstration farms should be as practical as possible. The profit-and-loss column of the ledger should be the principal item to show prospective buyers.

The size of a ranch for beef-cattle production in this region must necessarily be large as compared with a general farming proposition. The business must be large enough for the owner to get a living from the operations, and that requires the raising of a considerable number of cattle.

The man operating less than a section of land can not depend on cattle as the main farm enterprise without intensive pasture improvement or the use of other cattle range, as, under present conditions, 600 acres of pasture will carry but 60 head of cattle. On the other hand, the maximum size for a profitable cattle ranch is limited by the quantity of winter feed that can be produced. It must be borne in mind that the cut-over ranges do not support cattle the year round and that provision must be made for feeding cattle at least 3 months in winter. If farm labor can not be employed profitably to produce feed enough for the cattle, winter feed will have to be purchased.

Serious mistakes have been made by lumbermen who went into the cattle business on a scale out of proportion to their experience and knowledge of conditions. The most serious blunder has been to purchase large numbers of cattle and turn them loose without any provision for care or winter feed. Such mistakes have been costly and discouraging. In a great many cases lumbermen have been discouraged from entering the cattle business or have declared the business unprofitable because dividends are not quickly realized. In the production of beef cattle a large part of the profits are to be expected from the increase in the herd, and from 2 to 4 years are necessary to produce an animal for market.

As a general rule, cattle operations should begin on a small scale and be increased gradually, as the owner gains experience and is able to work out definite plans for the profitable enlargement of the business.

IMPROVEMENT OF CATTLE.

Considerable effort has been made to find a breed of cattle better suited to this region than the recognized beef breeds and larger than the native cattle. Cattle have been imported from tropical countries to cross on the native cattle or to breed pure. Undomesticated grazing animals have also been tried. Such experiments have naturally been disappointing because the object in view was to get a breed better adapted to the unfavorable conditions rather than to improve conditions themselves. It is not reasonable to expect satisfaction with any breed of cattle when half starved and covered with ticks. With the eradication of the ticks and the production of feed no other cattle will be better adapted for this region than the principal beef breeds which we already have.

The choice of a breed for this region is a matter for the individual owner to decide after his own conditions are taken into consideration. The "rustling" ability and hardiness of a breed usually is an important consideration, but the individual owner, if possible, should select the breed of cattle most generally grown in his community. The solution of the problem lies in fitting conditions to the cattle and not the cattle to conditions.

The foundation herd should be of native cows whenever possible. These are small and of inferior quality, but are also cheap. With the continued use of a pure-bred bull and judicious selection a valuable herd may be quickly built up. Quicker results may be obtained by purchasing grade cows at the beginning, but it is probable that the cheap native cows already acclimated and accustomed to the ranges will be better as a business proposition than cows brought in from other regions. Prospects for success in the Piney Woods are much more favorable for the man who grows into the cattle business than for the man who buys into it.

Pure-bred bulls of ample size and good quality and breeding should be used in every case if satisfactory improvement in the herd is expected. With money to purchase a foundation herd, it is a good policy to limit the number of cows and put the money, thus saved, into the bull. The terms "scrub bull" and "grade bull" should be synonymous from the standpoint of herd improvement, as neither has any place on the range. Although a grade bull may be a good individual he will not transmit his qualities with any degree of certainty. In other words, the prepotency which has been built up by years of breeding and selection in the pure-bred animal is lost in the grade.

Herd management in general must be such that the cattle will receive plenty of feed and reasonable care. Pastures must be provided so that bulls and heifers can be separated to prevent breeding of immature animals. Heifers should not be bred until they are of sufficient size not to be retarded in growth, or until they are about 18 months old. Calves should be weaned when they are old enough to take care of themselves and not allowed to continue sucking the dams, as is now generally practiced. If calves are weaned at the proper time the cows will breed more regularly and drop stronger calves. One bull should be kept for every 25 cows on the range, to insure a maximum calf crop.

In the Piney Woods section cows may be safely bred to drop calves in February or March and have 1 or 2 months' advantage over range calves of any other section of the country. Only when plenty of feed can be supplied throughout the winter should cows be bred to drop fall and winter calves.

The native cattle are not regularly supplied with salt and many of them have to learn to lick it. Salt is an important element and should be supplied to cattle regularly.

Methods of management depend on local conditions and must be worked out for individual cases. A definite system for growing, feeding, and marketing cattle should be outlined by each owner and followed consistently.

PASTURES.[1]

The South is frequently, though erroneously, referred to as "a land of no grass." This impression arises from the fact that for generations the cotton farmer has been taught to fight grass as a deadly enemy. His aversion to grass has been responsible in no small measure for the slow development of the cattle industry.

The commercial production of beef cattle on an extensive scale must be founded on the use of cheap pastures and forage crops, and the importance of beef-cattle production should be in direct proportion to the amount of grazing furnished. The abundance and quality of the native pastures, therefore, are points of prime importance in considering the cut-over lands for beef-cattle production.

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[1] The material in this bulletin relative to forage plants is prepared in accordance with the advice of the Office of Forage Crop Investigations of the Bureau of Plant Industry.

Though the Piney Woods region is not noted for the general use of tame or cultivated grasses, the growth of native vegetation is abundant in all sections, and in most places could be termed luxuriant.

NATIVE PASTURES.

The term "native pasture," as used in this bulletin, refers to the open range as left after logging operations. Such range is unfenced and covered with stumps, crowns, unmerchantable logs, and small timber. Practically no undergrowth is present immediately after the land is cut over, but a second growth of blackjack oak, scrub oak, or pine saplings appears in a few years, depending upon the kind of soil. Grazing is scarce in the virgin timber, as the ground is heavily shaded, covered with a carpet of pine needles, and burned over each year. With the removal of the timber grass becomes more abundant.

The principal native pasture grasses are wire grass,[1] broom sedge, carpet grass, lespedeza or Japan clover, "switch" or reed cane, maiden or blue cane, hop clover, and Bermuda grass.

In general the grasses of the native pastures consist almost entirely of wire grass and broom sedge, the important additions being carpet grass and lespedeza, which are not abundant except in pastures protected from fire. The native pastures furnish good grazing from early in spring until about the first of July, and the carrying capacity is relatively high. About that time wire grass and broom sedge begin to mature and the grazing is inferior, only the growing tender portions being eaten by cattle. Grazing changes largely to the Paspalums and lespedeza, and cattle require practically unlimited range to maintain themselves.

Although there is usually an abundance of dead wire grass left on the range during fall and winter, it serves only as a filler and cattle will not eat it if any other forage is available. Winter pasture consists almost entirely of canebrakes and some carpet grass, both of which are usually very limited.

Wire grass[1] constitutes the principal growth of the native pastures, and the Piney Woods is often referred to as the "wire-grass country." Wire grass furnishes good grazing in the growing season of early spring, and cattle make good gains during this season, but do not like it when the stems become hard and dry with mature growth.

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[1] The term "wire grass" includes a great many species of Aristida besides some of Sporobolus and Muhlenbergia. Small, in his Flora of the Southwestern United States, describes 28 species of Aristida.

Broom sedge is a coarse grass commonly considered a weed, which takes possession of old fields and waste places throughout the entire Piney Woods. It furnishes fairly good grazing early in spring, but is not relished by cattle as it approaches maturity.

Carpet grass (*Axonopus compressus*), is strictly a pasture grass, growing to a height of only a few inches, and is seldom if ever cut for hay. It prefers moist, sandy lands, but is not confined to lowlands, as good stands are found on the rolling and hill lands. It will stand closer grazing and heavier trampling than any of the other pasture grasses, solid stands of it occurring only where it is closely grazed. Farmers' Bulletins 1125 and 1130 treat this grass in detail.

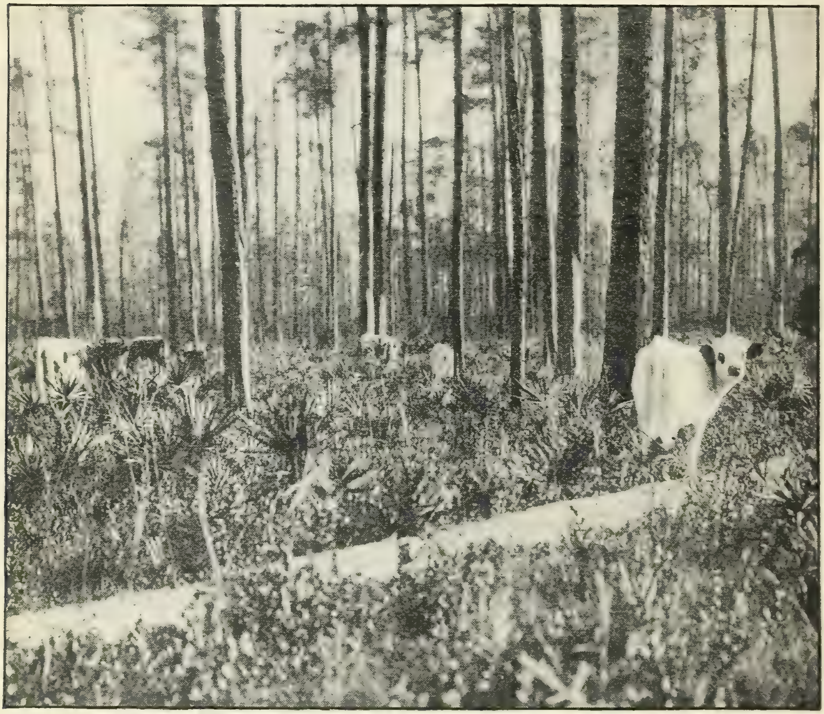

FIG. 6.—Native cattle grazing typical flatwoods range pasture in December.

Lespedeza or *Japan clover* is well distributed throughout the Piney Woods. It has shown an adaptation to cut-over lands surpassed by no other pasture plant in its ability both to spread rapidly and to flourish on a wide variety of soils. Detailed information regarding lespedeza will be found in Farmers' Bulletins 441 and 1125.

Switch or reed cane, *maiden cane*, *blue cane*, and *hop clover* are of minor value at present as forage plants. (See Farmers' Bulletin 1125.)

Bermuda grass is not found extensively in native pastures, except in a few favored spots where it has been transplanted. It is important only on cultivated land. (See Farmers' Bulletin 1125.)

CARRYING CAPACITY OF NATIVE PASTURES.

No experimental data are available as to the carrying capacity of the native pastures, but from observation and hundreds of inquiries it appears that 10 acres per head for 8 or 9 months in the year is a fair average. Cattle, as a rule, have unlimited pasture, and where the pasture is limited it is under fence and usually has been improved to some extent.

Questionnaires were mailed to every owner of a pure-bred beef bull in the Piney Woods, so far as lists were available, and answers to the question, "How many acres necessary to carry a cow on cut-over pasture?" varied from 4 to 20 acres, with an average of 8.3. Most of the answers of men grazing a considerable number of cattle were "Ten acres or more." Cattlemen of long experience in grazing cut-over lands, without exception give that number as the minimum for unimproved pasture during a grazing season of 8 or 9 months. During spring and the early part of summer the carrying capacity is probably 5 acres or less per head, but provision must be made for the inferior grazing after wire grass and broom sedge mature. Ten acres per head seems high for a humid region where vegetative growth is rapid, but is much lower than that required on western ranges and may be reduced considerably under proper management.

RANGE FIRES.

The native pastures have been almost universally burned over each year ever since the country was settled in Florida for fully 150 years, and especially since the time turpentine operations began in the virgin timber, long before the Civil War. In timber tapped for turpentine the face and base of the tree are saturated with resin and the box which catches the resin flow is within easy reach of ground fires. To protect the trees against accidental and pasture fires, the trash is raked away from the bases of the trees and the woods burned under watch each year, the carpet of pine straw and dead grass furnishing fuel. This practice makes it easier for the workmen to cover the ground as the underbrush is burned off.

During logging operations no precaution is taken to prevent fires from locomotives, and where the woods are not fired from this source the woods crew burn the undergrowth to make walking easier.

After the turpentine operator and the lumberman, the native cattle owners perpetuate the annual burning of the range. Cattlemen for generations have practiced burning the ranges in the winter or early spring because it makes earlier spring grazing. As a matter of fact, the grazing on burnt-over ranges is no earlier and may be considerably retarded. It should be done before the spring growth starts and not oftener than every three years, especially on heavily grazed pastures. Where a heavy growth of dead grass remains on the range during winter it affords considerable protection to the tender, growing parts underneath, so that some growth will be made even during winter. If the dead grass is burned in spring this protection is removed and much of the early growth that might be picked out by cattle is destroyed. Cattle prefer the burned pastures early in spring because of the ease of grazing, as they do not have to pick out the green from the dead grass and are able to get a quicker fill; but the carrying capacity of burnt range is no doubt lowered to a considerable degree by the injury done to growing plants.

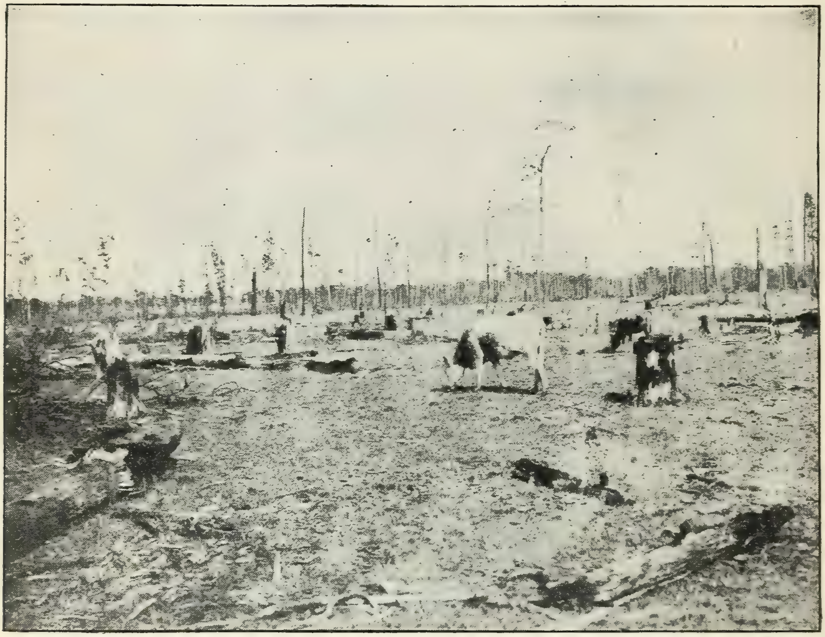

Fig. 7.—Native cattle grazing on open range which has been burned over. Compare the grass with that on range protected from fire, shown in figure 6.

Burning the range year after year for so long a period has been injurious to the pastures to an extent difficult to estimate. Perhaps the most serious injury by fire has been the destruction of vegetation before the organic matter could become incorporated with the soil to form humus, in which the soils of practically all that region are deficient. On clay lands continually burned over, the soil is often devoid of humus to such an extent that pastures will "checkcrack" in very dry weather and present much the appearance of the checks in a dried mud puddle. The quantity of organic matter in a single season's growth on cut-over land is very great, and when it is considered that practically all of it is consumed by fires the total loss of valuable fertilizer can readily be appreciated. On land used for farming purposes this annual destruction of organic matter means a heavy loss in crop production and the additional use of commercial fertilizer, which in itself is a poor substitute for a supply of humus.

Another effect of frequent fires on native pasture has been to keep out the desirable pasture grasses and perpetuate the undesirable ones. Wire grass and broom sedge have been able to withstand fires to such an extent that they have almost taken possession of the cut-over lands. These plants, although furnishing most of the grazing, are undesirable because of their short grazing season, and are no better adapted, except in their ability to withstand fire, than carpet grass and lespedeza, the two most valuable pasture plants found on the range.

The reason for the ability of wire grass to withstand fire and not close grazing is not altogether apparent, but it is largely accounted for by the habit of growth and the season of growth. The grass is perennial, firmly rooted, and grows in clumps, the stools of which protect the growing parts from fire to some extent. The plant matures early in the season and the fuel for fires in the fall is largely the dead stems and leaves of these plants. Thus it may be seen that fall fires come at a time when the plant has seeded and the season's growth is completed, while the spring fires do not affect the stools of the perennial plant as they do seedlings of annual plants and more tender perennials.

Although carpet grass is a perennial that stands close grazing, it is very susceptible to fire. The seed is matured late in the fall, and the plant is still growing at the time of fall fires. In the spring the tender, creeping stalks are not protected to the same degree as are the clumps of wire grass and broom sedge.

Lespedeza is seriously checked by fires because it is an annual which seeds late in fall at a time when fires are most likely to occur. Unshattered seeds are all destroyed and most of the seeds already dropped are destroyed, as they are loose and unprotected as compared with later in the season after beating rains have covered them with soil. The seeds are contained in a chaffy hull which burns readily. Spring fires come at a time when the seeds are germinating, or when the young plants are too tender to withstand fire.

Without the destructive annual fires the soils of the cut-over lands and the distribution of grasses would have presented a different aspect; and since the damage done is apparent, immediate steps should be taken to prevent fires. However, occasional fires under proper control may be used to remove accumulations of wire grass and to check the growth of brush.

SEMI-IMPROVED PASTURES.

For convenience of discussion in this report, stump land which has been fenced, cleared of underbrush or down timber, and protected from fire, is spoken of as semi-improved pasture, since these are the first steps for pasture improvement in the logical order in which they should come for natural improvement of the range. Very little work toward improving pastures has been done until the last few years. Owners of large tracts of land who have started in the cattle business have begun some pasture-improvement work, but, except in very few instances, they have not made progress enough to demonstrate its final value. On cut-over land, stumps ranging from 10 inches to 2 feet in diameter average about 50 to the acre, and these stumps, together with the crowns and unmerchantable timber left after logging operations, occupy much space on which no grass can grow. Land not closely grazed immediately after the removal of the timber is quickly taken up by a second growth of blackjack oak, scrub oak, and pine saplings, which shade the ground and also occupy considerable space.

The cost of removing stumps is prohibitive for cheap pasture on large areas, but "down" timber is cleared from the land by piling and burning or by marketing as firewood in near-by towns. Second-growth timber is removed by cutting with axes, but the oaks sprout immediately and require recutting the second or third year. In some cases goats and sheep have been used successfully in checking the growth of sprouts. Land fenced and cleared of down timber and second growth is usually protected from fire by burning around the edges or by keeping watch for fires and extinguishing them.

These methods effect an immediate improvement in the pastures by reducing waste space and shade. In addition, volunteer lespedeza and carpet grass make their appearance and improve the pasture rapidly. Confining the cattle by fencing means closer grazing, and with close grazing and trampling wire grass and broom sedge are checked and carpet grass and lespedeza take their places. Rapid improvement in the carrying capacity and quality of the pastures has been observed in many places on limited areas when these methods were used, and the improvement of the pastures, especially by protection from fire, shows great future promise.

Semi-improved pasture in Covington County, Miss., protected from fire was closely observed for 2 years. During that time the stand of lespedeza was estimated to have increased 75 per cent. It was thoroughly distributed throughout the pastures and constituted from a third to half a stand. Carpet grass also increased to an appreciable extent. No seed of either plant was ever sown on these pastures.

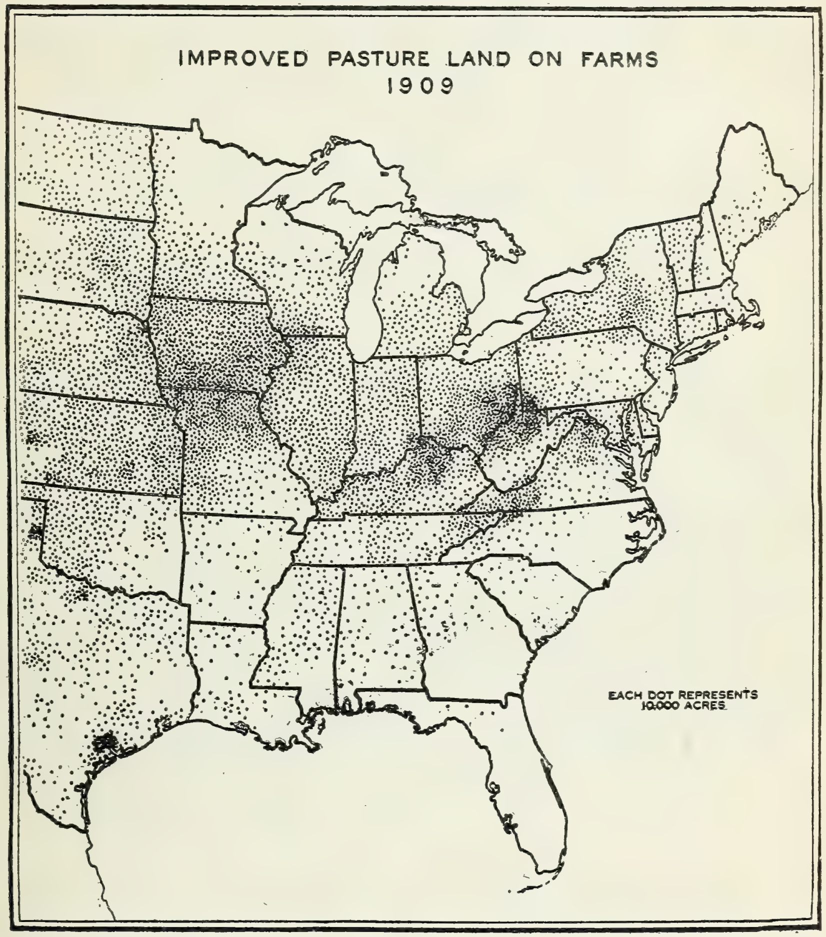
IMPROVED PASTURE LAND ON FARMS
1909
EACH DOT REPRESENTS 10,000 ACRES

FIG. 8.—Improved pasture land on farms. Compare the improved pasture lands of the Coastal Plain with that of the cattle-producing section of the Middle West.

Similar instances were mentioned by a large number of men in answering the questionnaires sent out.

Land fenced and cleared to some extent facilitates seeding to carpet grass and lespedeza without cultivation, but very little information is available as to results by any other method than natural seeding.

IMPROVED PASTURE.

Improved pasture as referred to in this report is defined as pasture which is fenced, protected from fire, and seeded to some pasture grass. Practically all such pasture is on cultivated land which has been cleared of stumps and is under cultivation. Bermuda grass is the foundation of practically all improved pastures in the Piney Woods.

At Collins, Miss.,[1] excellent stands of lespedeza and Bermuda were obtained on native pastures which were disked and the seed sown broadcast at the rate of 15 pounds of lespedeza and 3 pounds of Bermuda per acre.

At the McNeill station, in southern Mississippi, E. B. Ferris reports success through sowing 2 pounds of Bermuda-grass seed to the acre, mixed with 100 pounds of fertilizer, on rough land cleared only sufficiently to get a "scooter" plow through it to break it up in patches here and there. The land was sufficiently sodded to make good pasture after midsummer of the first year. Later the Bermuda grass was crowded out by carpet grass. However, Mr. Ferris adds:

> Many of the best pasture crops do not thrive as they should on the wild lands until the lands have been plowed and sweetened—at least to a limited extent. To plow and mow these lands with stumps still on them is almost out of the question.[2]

Good results have been observed in a few instances where lespedeza and carpet grass had been sown on rough stump land, disked or roughly broken with plows. Lespedeza and carpet grass show particular promise for seeding on stump land, as they are especially adapted and come in naturally on such land. Carpet-grass seed is now a commercial product. Stands may also be obtained by protecting patches of carpet grass from grazing, cutting the hay, and scattering it over the ground to be seeded.

In the improvement of native pastures many varieties of forage plants are useful. Among these are Bermuda and carpet grass, already referred to, which are recommended as a foundation for permanent pasture. Good results can not be expected from any of the northern pasture grasses, a possible exception being white clover. Alfalfa is not adapted to the Piney Woods section. Many imported grasses, such as Para grass, Rhodes grass, Guinea grass, St. Augustine grass, Natal grass, and Napier grass, have been tried and found important in some sections, but are limited to the coast line and the peninsula of Florida because of injury by frost. Information as to these grasses can be found in Farmers' Bulletin 1125.

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[1] The work at Collins, Miss., was conducted by the Bureau of Animal Industry, U. S. Department of Agriculture, in cooperation with the Mississippi Agricultural and Mechanical College, on the ranch of H. M. McIntosh, and was continued for 2 years.

[2] Mississippi Bulletin 180.

TEMPORARY PASTURES.

Temporary pastures include winter-grazing crops or cover crops and volunteer or unseeded crops on cultivated lands. Winter-grazing crops consist of the small grains, such as oats and rye, and winter-growing annual legumes, such as bur clover, crimson clover, and vetch. The most important volunteer pasture crops are crab grass, Mexican clover, and beggarweed.

Winter oats of a rust-proof variety sown early in fall are used for winter grazing. Oats can be grazed slightly in the fall and winter, but as the oats are usually grown for the grain crop, heavy grazing is questionable. (Farmers' Bulletin 436.)

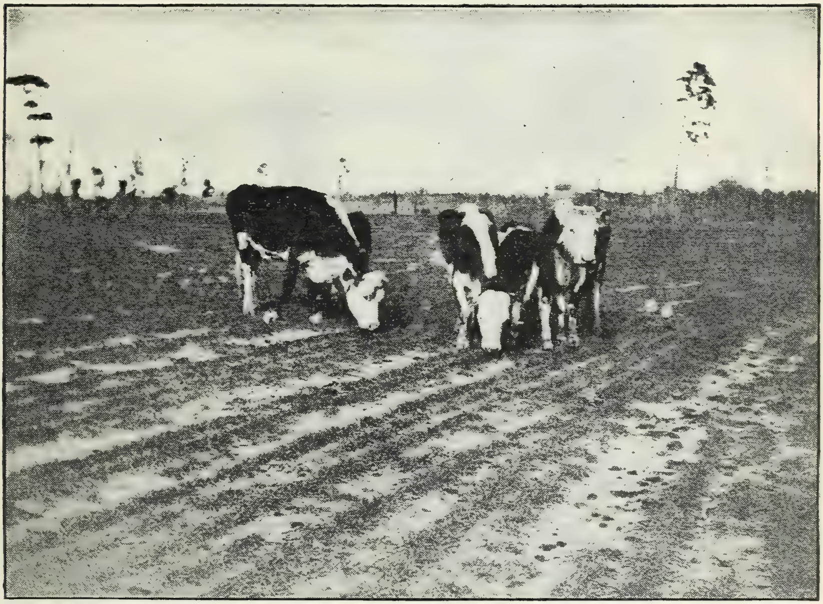

FIG. 9.—Cattle grazing Abruzzi rye in February on the beef-cattle experiment farm at Collins, Miss. This pasture was grazed from the latter part of November until the last of March.

Hairy or *sand vetch* is frequently sown with oats for winter grazing. The addition of vetch greatly increases the winter grazing and the cattle may be removed in the spring and the oats and vetch cut for hay. (Additional information concerning vetch in southern sections is contained in Farmers' Bulletins 515 and 529.)

Rye, especially the Abruzzi variety, which was introduced by the United States Department of Agriculture from Italy, has proved to be far superior to oats for winter grazing. At Collins, Miss., in the fall of 1917, Abruzzi rye and oats were sown the same day on equal parts of a field and under exactly the same conditions. The rye made good growth and furnished excellent grazing through winter and early spring, and after pasturing was cut for grain. Scarcely a single spear of oats survived the severe winter and furnished no grazing whatever. (Detailed information concerning rye is contained in Farmers' Bulletin 894.)

Crimson clover is an annual winter-growing legume grown to some extent in the Piney Woods for pasture and hay. Crimson clover furnishes very little fall or winter grazing, but is important for 6 weeks in the early spring between rye and other pasture. (Crimson clover is fully discussed in Farmers' Bulletins 550, 579, and 1125.)

Crab grass is the most common volunteer grass after cultivated crops. It comes in thickly after early corn has been laid by, and if the corn is removed makes considerable grazing through September and October. (See Farmers' Bulletin 1125.)

Mexican clover, also called "Florida pusley," is not a true clover or legume, but is a summer annual belonging to the madder family, which makes a rank growth resembling red clover. It is a common volunteer crop after early corn in most sections of the Piney Woods and makes a heavy growth each year when once established. After removal of the corn it makes fairly good grazing until heavy frost and makes a fair quality of hay and is often cut for that purpose. Its value as a cover crop, as late fall grazing, or as a hay crop, should entitle it to some consideration. The seed is not sold commercially, but may be obtained from lofts where the hay is stored, and is sown in the spring at the rate of 5 or 6 pounds per acre.

Beggarweed, an annual legume growing erect and reaching a height of from 4 to 8 feet, is a common volunteer crop through all sections of the Piney Woods, but makes its best growth in Florida. It has a high feeding value and makes excellent grazing until some time after frost. It is often cut for hay and is relished by cattle, although it is usually coarse. Seed is easily collected and may be sown at a small cost where the plant is not already well established. (See Farmers' Bulletin 1125.)

PERMANENT PASTURES.

Permanent pastures of exceptionally high carrying capacity and long grazing period can easily be established and maintained on lands cleared of stumps and under cultivation. These pastures supplemented with temporary pastures for winter grazing enable the farmer to graze his cattle throughout practically the entire year.

Included in the questionnaire sent to pure-bred breeders was the question: "How many acres are necessary to carry a cow on improved pasture?" The answers to this question varied from one-quarter of an acre to 3 acres, with the majority giving 1 acre per head. The average of all answers was 1.6 acres per head for the grazing season. Fifty-seven per cent of these men reported no improved pasture. The foundation of practically all these pastures was Bermuda grass, although a large number included lespedeza and a few were carpet-grass pastures. That the average of 1.6 acres per head is a conservative figure for improved pastures is borne out by the writers' observations in all sections. Many pastures have been observed which had a considerably higher carrying capacity, and as a rule the Bermuda and carpet-grass pastures are understocked rather than overstocked during the season of most rapid growth. Both Bermuda and carpet grass will stand very close grazing, and Bermuda especially is not relished by cattle if it is allowed to make a rank growth.

The general farmer or small landowner should spare no effort in establishing pastures on cleared lands in order that the small number of cattle he is able to keep may have the most favorable grazing. The large landowner or ranchman with many cattle can establish pastures on cleared land only gradually and in a limited way. He is concerned with utilizing the cheap range pasture and his problem is improving large areas of the native pasture with the stumps on. Cost is the limiting factor in improving large areas and the problem is necessarily more difficult in its solution. The native pastures can not be improved immediately to have the carrying capacity of the permanent pastures described above without clearing the land. They may be gradually improved, however, at a very small cost, so that their carrying capacity will be doubled.

Considerable selection can be made from the great number of pasture and forage crops grown in the Piney Woods section, but certain crops have become prominent in different regions. The recommendations for the Coastal Plain as given by the authorities of the different experiment stations is tabulated below, including the three important pasture and hay plants of each State. Many other crops which do well are not included. The recommendations were given by Director H. W. Barre, of South Carolina; Prof. J. R. Fain, of Georgia; Director P. H. Rolfs, of Florida; Director J. F. Duggar, of Alabama; Director of Stations J. R. Ricks, of Mississippi; Dean W. R. Dodson, of Louisiana; Director of Extension W. C. Lassetter, of Arkansas, and Prof. A. B. Conner, of Texas.

TABLE 3.—*Pasture and hay crops for the Coastal Plain.*

Station.	Pasture.	Hay.
South Carolina (Barre)	Bermuda, carpet grass, lespedeza	Cowpeas, velvet beans, sorghum.
Georgia (Fain)	Carpet grass, Dallas grass, Rhodes grass	Cowpeas, sorghum, beggarweed.
Florida (Rolfs)	Bermuda, carpet grass, Para grass	Crab grass, cowpeas, beggarweed.
Alabama (Duggar)	Bermuda, lespedeza, bur clover	Cowpeas, sorghum, lespedeza.
Mississippi (Ricks)	Carpet grass, lespedeza, Bermuda	Lespedeza, cowpeas, Sudan grass.
Louisiana (Dodson)	do	Cowpeas, lespedeza, sorghum.
Arkansas (Lassetter)	Bermuda, carpet grass, lespedeza	Cowpeas, soy beans, sorghum.
Eastern Texas (Conner)	Bermuda, lespedeza, bur clover	Cowpeas, Sudan grass, sorghum.

RECOMMENDATIONS.

The improvement of the native pastures is the most important problem of beef-cattle production in the Piney Woods. Although there is an abundance of grass on the range it furnishes good grazing for a short period only and the native grasses must be replaced to a considerable extent by more desirable plants before the pastures will have a high carrying capacity. A system of management must be devised to bring about the gradual replacement of the native grasses by facilitating the spread and natural reseeding of more desirable forage plants.

Two very important forage plants, carpet grass and lespedeza, have established themselves in practically every county of the Piney Woods; and, while it is not advisable to discontinue the trial of other pasture plants, every effort should be made to protect and facilitate the spread of these two. At present there are no other plants known which are so desirable and so well adapted to this region. The worst enemy to the spread of carpet grass and lespedeza is fire. With fencing, fire protection, removal of undesirable underbrush, and proper stocking the natural spread of these two plants is rapid. Every practical effort should also be made to protect the growth of young pine on land not suited to cultivation.

Fencing and fire control are the first two steps toward pasture development. A fence establishes ownership and property lines, keeps out scrub bulls and other cattle, aids in establishing fire controls, and confines cattle to a definite area. The ranges deteriorate rather than improve so long as fire runs over them annually. The advantage of fire protection from the standpoint of increasing the fertility of the soil and protecting desirable pasture plants is beyond question and has been repeatedly demonstrated by individual owners.

For the individual owner to prevent fires on his pasture when the surrounding range is fired is a difficult matter, but it can be accomplished by constant watch, burning around the pasture, or plowing a strip wide enough to stop fire. Prevention of fires is the most logical method, but it can not be done until cattle owners and land owners realize the destruction done. Accidental fires may be prevented by precaution, but so long as the belief prevails that the grazing of cattle is improved by annual burning of the range, set fires will run over the range each year. Concerted action should be taken by cattlemen and the owners of range land to start an educational campaign against fires and procure suitable legislation for their prevention.

If the land is to be used exclusively and permanently as pasture, second-growth oaks should be kept down, because they will shade pasture plants and occupy considerable space. Underbrush may be cut but will quickly sprout and require recutting in the course of 2 or 3 years. If closely grazed by sheep or goats the sprouts may be killed. An arsenic poison has been successfully used for killing all kinds of timber and effectually preventing sprouts. Trees are killed in a few weeks' time and often in a few days by deep girdling and applying a solution made according to the following formula:

White arsenic (arsenic trioxid)	1 pound.
Washing soda	1 pound or
Caustic soda	½ pound.
Whiting	½ pound.
Water	4 gallons.

Dissolve the soda in water, using heat if necessary; then slowly add the arsenic, previously made into a thin paste, stirring all the time; place on a strong fire and boil for half an hour, stirring from time to time. When the arsenic is thoroughly dissolved add the remainder of the water to make up the 4 gallons. The whiting shows the trees treated, as it turns white on drying. Trees are girdled by a heavy downward stroke of the axe cutting through the bark and well into the wood. From a half-pint for small trees to a quart for large ones is applied to saturate the girdle. Saplings may be cut off low and the poison thoroughly applied with a swab. The poison is more effective if applied in winter or early in spring, but will kill trees at any time.

Down timber should be removed for firewood or piled and burned, as it occupies space on which no grass can grow. The removal of underbrush and down timber increases to a considerable extent the carrying capacity of pastures.

Seeding the native pastures, following the removal of second-growth and down timber, will facilitate the rapid replacement of the native grasses. Lespedeza and carpet grass may be sown on favored spots of unprepared ground to hasten their natural spread, or where the land is sufficiently clear it may be disked at little cost before seeding. Disking also helps kill out the wire grass. The beds of old tramroads from which the ties have been removed furnish seed beds where desirable grasses may be established and gradually spread over the pasture.

Stocking the pastures heavily gradually kills out wire grass and establishes carpet grass, but where pasture is grazed close enough in spring to kill wire grass other pasture must be provided during summer and fall, as the cattle will suffer if not given wider range when the pasture begins to fail. Wire grass and broom sedge must be grazed closely to be fully utilized, as cattle do not eat it readily after it matures. The pasture will gradually improve if closely grazed and protected from fire at the same time, but should be seeded to lespedeza and carpet grass for rapid improvement.

Where some improved pasture is available, the native pasture may be grazed closely in the early part of the season, gradually removing the cattle to the improved pasture. This method allows the improved pasture to get a good start while the native pasture is being used to the fullest advantage.

Improved pasture on cultivated land should be established gradually for permanent pasture whenever possible, especially by the small farmers who have limited pasture. Bermuda is recommended on rich ground or ground to which manure has been applied, but should always have lespedeza and bur or white clover added. Carpet grass is much better adapted for the foundation of pastures on sandy lands and should be sown with Bermuda whenever the seed can be obtained. Lespedeza should be sown with carpet grass.

Abruzzi rye, especially if vetch or bur clover is sown on the same field, is recommended above any other crop for winter grazing.

WINTER FEEDS.

The saving of the dry roughage, such as corn stover, and the making of hay are rendered somewhat difficult in the Piney Woods section because of the frequent rains at seasons when the crops mature and the moist atmosphere, which is favorable to the growth of molds on forage when left in the field, especially corn stover in shocks.

Corn stover may be cured and fed from the field in favorable seasons, but it is usually necessary to rick it with some protection from the weather or store it under cover. The common method of utilizing corn stover is to pasture the stalk fields in the fall after the corn has been snapped. especially since velvet beans are now commonly planted in all corn, and the vine growth makes the cutting of stover very difficult. When properly saved, corn stover is a very valuable roughage for winter feed, but if left in the field a considerable portion of the forage is trampled down, damaged by rains, or blown away, and much of the feeding value is lost.

Lespedeza is gaining favor rapidly as a hay crop. It has been very successfully grown for hay on the heavier soils, especially when supplied with some phosphate fertilizer. It contains little water and is the easiest of all legumes to cure into hay. When grown in dense stands it is very heavy in weight because of the fine, solid stems, and even when only 6 to 8 inches high and apparently hardly worth cutting for hay it will yield a ton or more per acre. The hay is of excellent quality, is relished by cattle, and is equal in feeding value to alfalfa hay. When the seed is sown in February or March on oat land it will make a crop of hay the first season after the oats are harvested. The plants, if allowed to mature, will reseed the land indefinitely. After the lespedeza is removed the land may be again sown in oats. Ferris, at the McNeill station, Miss., reports the best yields of oats by using this method, and obtained 2 tons of lespedeza hay following the oats.[1] No other hay crop in that section is more valuable as a feed. It can be grown with less trouble and expense than any other hay crop and at the same time it improves the land for future crops. (This subject is discussed in Farmers' Bulletin 441.)

The cowpea is the most common cultivated crop grown for hay in the Piney Woods section. This crop commonly follows oats and is sown broadcast for hay, as it smothers weeds and crab grass. (Detailed information concerning cowpeas is contained in Farmers' Bulletins 318, 1125, and 1153.)

The soy bean is an annual legume similar to the cowpea but is not so extensively used. It makes a heavier growth of seed than the cowpea, but when sown broadcast cowpeas make a heavier yield, as well as smothering the weeds. (Soy beans are discussed in detail in Farmers' Bulletins 931, 973, and 1125.)

Peanut hay is rapidly coming into use in some sections of the Piney Woods, especially in Alabama and Georgia, and is now put on the market as a commercial hay. Peanuts are grown as a forage crop after the removal of oats or rye and the tops mowed for hay the same as cowpeas or other legumes, leaving the nuts in the ground to be harvested by hogs. The yield of hay is between 1 and 2 tons an acre. Peanut hay is coarse but of good quality, is relished by cattle, and has a feeding value equal to clover hay. (Methods of growing and handling the crop are fully discussed in Farmers' Bulletins 431 and 1125.)

Table 4 gives the analyses of lespedeza, cowpea, and peanut-vine hay as compared with alfalfa hay.

TABLE 4.—*Analyses of three southern legume hays compared with alfalfa hay.*[1]

Kind of hay.	Number of analyses.	Constituents.					
		Water.	Ash.	Crude protein.	Carbohydrates.		Fat.
					Crude fiber.	Nitrogen free extract.	
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Alfalfa	250	8.6	8.6	14.9	28.3	37.3	2.3
Lespedeza	14	11.8	5.8	12.1	25.9	41.6	2.8
Cowpea	35	14.8	7.3	16.5	20.4	37.3	3.7
Peanut vine	7	21.5	8.7	9.1	20.2	36.8	3.7

[1] Analyses from Henry and Morrison.

Table 4 shows lespedeza hay to be practically equal to alfalfa hay. It is slightly lower in crude-protein content, but is also lower in fiber content and higher in fat. Cowpea is higher in crude-protein content than alfalfa, lower in fiber, and higher in fat. Peanut hay is not equal to these hays in crude-protein content, but is low in fiber and high in fat.

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[1] Mississippi Bulletin 180.

Sudan grass is frequently sown in mixtures with cowpeas or soy beans for hay and facilitates the curing of the hay. At the McNeill station, in Mississippi, Sudan grass, planted in drills 3 feet apart about the middle of May, gave two cuttings totaling 4 tons of hay. With the exception of lespedeza, which it exceeded in yield, it was superior to any other hay tried at the station. (Detailed discussion of Sudan grass may be found in Farmers' Bulletins 605, 1125, and 1126.)

Sorghum is sown broadcast and cut for hay to some extent in the section described. It is a good yielder, but the large, juicy stems make it difficult to cure and it is more valuable and more easily handled as a silage crop. (See Farmers' Bulletin 1158.)

Crab grass, *Mexican clover*, and *beggarweed* are volunteer crops which are important for hay, as they cost nothing except to harvest.

Crimson clover is grown to a limited extent as a hay crop. The hay is of good quality and is relished by cattle. Other crops seem to be better adapted as hay crops.

Hairy or *sand vetch* is planted in the fall with oats or rye and the crop is grazed during winter and early spring, yet it makes a heavy yield of hay after the removal of the cattle. (See p. 29.)

Cottonseed hulls is a commercial feed obtained as a by-product of the manufacture of cottonseed oil. It has been extensively used as a roughage and is about equal to corn silage, but is much more expensive and is being replaced by cheaper home-grown roughages.

The velvet bean (Farmers' Bulletins 962 and 1125), an annual leguminous, twining vine, is now grown in the Piney Woods more extensively than any other crop except corn, with which it is almost always planted. The velvet bean was grown first in Florida and has been cultivated extensively only in recent years. In 10 years, however, the acreage has grown from an insignificant figure to a point where practically every acre of corn in the Piney Woods is now planted to velvet beans, the most important forage and feed crop grown there.[1]

At the present time cornstalk and velvet-bean pasture is the principal winter-forage crop of the Piney Woods both for maintaining cattle through the winter and for fattening them. The practice of pasturing cattle on velvet-bean fields has become such an important factor in wintering cattle that most farmers provide no other winter feed. The cattle are held on the native pastures until the pastures give out and are then put on velvet-bean fields to hold them until grass comes in the spring.

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[1] Farm practices that increase crop yields in the Gulf-coast region are discussed in Farmers' Bulletin 986.

After the corn is harvested the beans are usually partly picked if the cattle are to be carried through the winter on a maintenance ration, but if cattle are to be fattened they are turned on fields from which no beans have been picked. The leaves remain on the vines for a considerable time and are eaten better by cattle after frost comes. The beans remain in the field about three months during the winter without shattering or damage from rains. In fact, after they have been softened by rains the cattle like them better. Beans which are trampled to the ground are utilized by following the cattle with hogs. The carrying capacity of the pasture varies considerably according to the yield of beans per acre, but it is usual to allow from one-third to one-half an acre per head per month. It requires from 1 to 1½ acres to carry a cow through the winter.

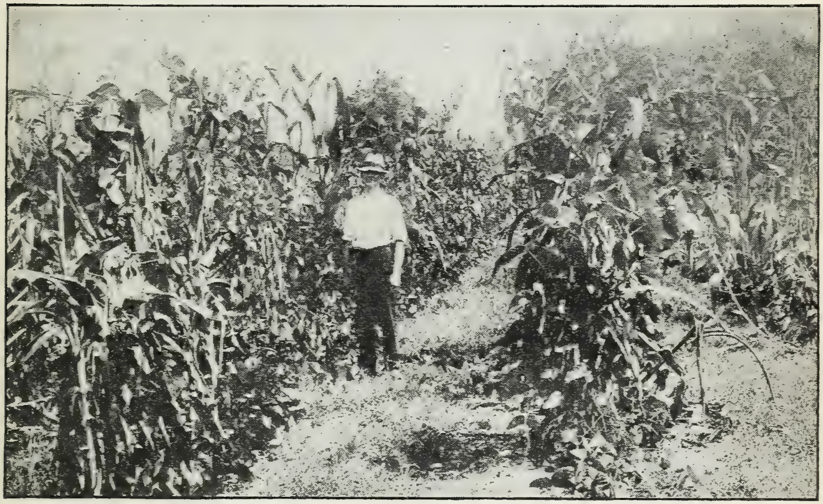

FIG. 10.—Corn and velvet beans. Velvet beans make an excellent growth along with the corn.

At Collins 56 head of mature breeding cows and 22 head of mature native steers were turned on 40 acres of velvet-bean pasture December 3, 1917. The pasture consisted of stalk fields from which the corn had been snapped and velvet beans left unpicked. Ten acres of this field would have yielded 1,000 pounds or more of picked beans per acre, but the beans on the remainder of the field were scattering. The average yield of the entire field was estimated at 500 pounds an acre. The pasture was practically exhausted at the end of a 28-day period and hogs were left to clean up the remaining beans. Pasture was furnished at the rate of one-half acre per head per month and the breeding cows made an average daily gain of 1.25 pounds a head.

Stock cattle are sometimes given limited pasture on bean fields from which no beans have been picked. By this method the cattle are turned on the field for an hour or more each day and then taken off. This lengthens the grazing period and is an economical way to handle the crop if cattle are not to be fattened. If steers are to be fattened for market they are often allowed the run of a bean field until the best of the beans are consumed, then removed to a new field, and the stock cattle turned on the old field to clean up what is left.

The sandy soils of the Piney Woods region are not injured by pasturing cattle while the ground is wet during winter, and where velvet beans are utilized in this way considerable labor is saved and the fertility contained in the crop is left on the ground, adding greatly to the value of the crop as a soil improver. Since the beans will keep in the field until consumed and few beans are lost, it would appear that the only advantage in harvesting the beans for feed is in controlling the quantity of beans consumed. However, there are several serious objections to pasturing the beans as now practiced. These points are discussed under "Recommendations for winter feeding."

It is worthy of particular note that nearly all the important forage crops of the section are legumes. Besides the high feeding value due to the protein content, the legumes have a high content of lime, which is a very necessary element in the growth of animals. Timothy hay has 2.5 pounds of lime per 1,000 pounds, while cowpea hay has 25.4 pounds.[1] The soils of this region are naturally deficient in lime and the increased use of legumes, especially for young growing animals, should be highly beneficial.

CONCENTRATED FEEDS.

The velvet bean is the principal concentrated feed now used for feeding cattle in the Piney Woods and with the increasing acreage grown each year it is rapidly replacing all other concentrated feeds both for fattening and wintering cattle. Aside from its recognized value as a feed it is a home-grown crop which is more readily marketed through cattle than in any other way. The increased use of velvet beans has permitted the shipment of larger quantities of cottonseed meal to other sections of the country, as the meal is a more concentrated feed for which there is a well-established market. In some localities since 1915 the production has greatly exceeded the amount needed for home consumption and mills have been established for drying and grinding the beans into a commercial feed. For home consumption the beans are usually fed in the pod, as they are difficult to grind, quickly become rancid, and the feeding value is not increased by grinding.

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[1] From Henry and Morrison.

That the velvet bean is a very valuable concentrated feed for cattle has been thoroughly demonstrated. Feeding tests have shown that about 2 pounds in the pod are equal to 1 pound of cottonseed meal and in addition the roughage required is lessened because of the dry matter in the bulky pods. The high feeding value of velvet beans in the field is beyond question and it is now a common practice to market fat steers directly off the bean fields in February and March. Though these steers do not have the high finish of steers fed during a longer period they sell for a good price. The practice of fattening cattle on velvet-bean pasture is an economical one, because few beans are wasted, little labor is required, and the fertilizing value of the crop is retained on the land.

The Bureau of Animal Industry, United States Department of Agriculture, with the cooperation of the Mississippi experiment station, conducted an experiment at Collins, Miss., during the early part of 1918, to determine the economy of a ration of velvet beans and corn silage when fed to fattening steers and also to compare the relative feeding value and economy of whole velvet beans in the pod and velvet beans crushed with the pods. The experiments are being continued, and while no detailed results have as yet been published, the following table gives a summary of the data obtained:

TABLE 5.—*Velvet beans in pod compared with velvet beans and pods crushed.*

[Cattle-feeding experiment at Collins, Miss., Jan. 1 to Apr. 5, 1918—94 days.]

Item.	Lot 1. Beans in pod and corn silage.	Lot 2, Beans and pods crushed and corn silage.
Number steers in lot	11	11
Average daily ration per head (full feed):		
Velvet beans in pod ... pounds	10.9	....
Velvet beans, crushed ... do	....	10.9
Corn silage ... do	22.0	22.0
Average initial weight per head ... do	660	660
Average final weight per head ... do	793	790
Average total gain per head ... do	133	130
Average daily gain per head ... do	1.41	1.38
Silage consumed per hundredweight gain ... do	1,710	1,717
Velvet beans consumed per hundredweight gain ... do	621	621
Feed cost per 100 pounds gain	$11.72	$13.29
Average shrinkage in transit to market ... pounds	79	79
Average dressing, market weights ... per cent	56.1	55.22
Initial cost per 100 pounds	$7.50	$7.50
Selling price per 100 pounds	$12.00	$12.00
Average profit per head	$13.70	$11.61

Twenty-two head of native Mississippi steers from 3 to 5 years old, showing no evidence of improved beef blood and averaging 660 pounds, were used in this test. Preliminary to being placed in the feed lots the steers were pastured on cornstalk and velvet-bean pasture for 28 days. The corn had been snapped and the unpicked beans left in the field were estimated to average 500 pounds an acre. The steers made an average daily gain of 1 pound a head on pasture.

When taken off pasture the steers were divided into two lots and fed 94 days. Lot 1 was fed whole velvet beans in the pod and corn silage. Lot 2 was fed velvet beans and pods crushed and corn silage. No other roughage or concentrate was fed. Both lots were fed in a similar manner, the only difference being in the preparation of the beans for Lot 2. The average daily ration per head on full feed was 10.9 pounds of velvet beans and 22 pounds of corn silage. Corn silage was valued at $5 a ton and whole velvet beans at $25 a ton. The charge for crushing the beans was $4 a ton, making them cost $29.

The steers of Lot 1, getting whole beans, relished their ration, while the steers of Lot 2, getting crushed beans, would not clean up their feed as fast nor consume as much as Lot 1 had the latter been allowed to eat as much as they wished.

The average daily gains, 1.41 pounds and 1.38 pounds for Lots 1 and 2, respectively, were practically the same and were satisfactory for the class of steers and the rations fed.

The amount of feed consumed per 100 pounds gain was almost identical in both lots. The quantity of silage consumed per 100 pounds gain was very low, owing to the large quantity of roughage in the bean hulls.

The feed cost per 100 pounds gain was $11.72 and $13.29 for Lots 1 and 2, respectively. Since the pounds of feed consumed per 100 pounds gain was almost identical in both lots, the extra cost of $1.57 per 100 pounds gain in Lot 2 was due to the charge for crushing the beans. It is interesting to note that Lot 1 made gains for less cost per 100 pounds than the selling price, which was $12 for both lots.

The steers were 96 hours in transit to market, with a resulting heavy shrinkage. Lot 1 dressed by market weights 56.1 per cent, and Lot 2, 55.22 per cent.

The plan of the experiment was to carry the steers for a longer feeding period, but the silos at the station were destroyed by fire, making it necessary to ship at once. In general, however, the steers were fairly well finished for steers of their quality, as is shown by the dressing percentages.

Hogs following the steers without other feed did not make satisfactory gains. The hogs following the steers that got crushed beans lost weight at the time the steers were on full feed.

The results of this experiment indicate that velvet beans and corn silage make a satisfactory ration for fattening steers and produce economical gains. The steers in the lot receiving whole beans in the pod consumed their feed more readily than the lot getting ground beans. They also made larger daily gains, cheaper gains, and dressed a higher percentage by market weights. The added cost of preparing the beans for Lot 2 reduced the profit $2.09 a head. These steers sold for $12 per 100 pounds, which was the highest price ever paid at the St. Louis market for native Piney Woods steers up to that time. However, fat grade steers showing crosses of pure-bred beef blood, and averaging 1,247 pounds each, sold the same day for $15.25 per 100 pounds.

At the station during the winter of 1917, 18 head of grade breeding cows, 7 of which had calves at foot, were fed a maintenance ration of corn silage and velvet beans in a dry lot. The cows maintained their weight for 46 days on a ration of 20 pounds of silage and 4 pounds of velvet beans in the pod. The cost of this ration per head was 10 cents a day when silage was charged at $5 a ton and velvet beans at $25 a ton.

Twenty head of pure-bred breeding cows, 4 of which had calves at foot, were fed 70 days on a ration of velvet beans crushed in the pod, and corn silage. These cows gained 15 pounds a head for the period on an average daily ration of 7.9 pounds beans and 26.5 pounds of silage. The cost of the ration was 18 cents a day when silage was charged at $5 a ton and ground beans at $29 a ton.

Although the high value of velvet beans as a soil-improving crop and a cheap home-grown feed are now generally recognized, as is evidenced by the enormous increase in the acreage grown in the last few years, the possibilities of this feed have been barely touched even in the region which is its natural home. To northern and western feeders who annually buy large quantities of protein feeds the velvet bean is still a curiosity. A few years ago the Piney Woods were looked upon as a future field for the production of large numbers of feeder cattle, to be shipped to other sections for finishing, because no crop had been found which would produce large quantities of feed for fattening cattle. Already that region has become a heavy buyer of western cattle to consume its velvet-bean crop, for which there was no other market except through cattle.

Corn is fed to cattle in that region in very limited quantities. The total production of corn is not great and some is shipped in each year to be utilized as feed for work stock and for fattening hogs.

Cottonseed meal, until the advent of velvet beans, was the concentrate most generally used for feeding cattle, but in recent years its use has diminished rapidly to give place to velvet beans, which could not be marketed so readily as a commercial feed. The demand for cottonseed meal for shipment is such that velvet beans are usually a more economical feed for cattle. The value of cottonseed meal as a cattle feed is so well known generally that it needs no discussion here.

Peanut meal, a by-product of the manufacture of peanut oil, is now produced in some sections of the Piney Woods in considerable quantities and is rapidly gaining favor as a feed for cattle. According to analysis, "peanut-oil cake" and "peanut-oil meal," made from shelled nuts, are practically equal to cottonseed meal, but their comparative value for feeding cattle has not been determined. Peanut meal is extensively used and is valued highly as a cattle feed in Europe.

Peanut hulls are high in fiber and have no higher feeding value than grain straw. Peanut meal from unshelled nuts contains about one-half as much crude protein as the meal made from shelled nuts. The hulls are often ground and added to the meal as an adulterant to give bulk to the feed.

The American feed-control officials classify "peanut-oil cake" and "peanut-oil meal" as products made from shelled nuts. When unhulled nuts are pressed the product should be labeled "unhulled peanut-oil feed" and the ingredients given as peanut meal and hulls.

Some of the most valuable protein concentrates, both commercial and farm grown, are now produced in the Piney Woods region in sufficient quantities to fatten a much larger number of cattle than are now produced. When it is considered that less than 10 per cent of the land is in cultivation the possibilities for feed production become apparent.

SILAGE CROPS.

Corn is the most generally used and most reliable crop for silage in that region and is considered superior to any other silage. From 5 to 6 tons of silage is a fair average yield. On the richer lands and on lands well fertilized the yields run as high as 10 to 12 tons an acre. The long growing season permits corn planted the first of July to mature for silage and a crop of corn for silage commonly follows oats.

Sorghum ranks next to corn as a silage crop and exceeds corn in the tonnage per acre. Sorghum silage is practically equal to corn silage in feeding value, although the latter is usually preferred. Sorghum in that section is a very reliable crop and is much more easily saved as silage than as hay.

Corn-and-velvet-bean silage has been used in a very limited way because of the difficulty of cutting the crop and removing it from the fields, but where the crop has been utilized in this manner it has met with instant favor. The silage is dark in color but of excellent quality and is eaten greedily by cattle. Since the beans are later in maturing than the corn, the corn is left until well matured. The dry fodder improves the keeping quality of the beans so that the silage does not become rank and black as does silage made from a legume alone. The velvet bean increases the protein content of the silage to a marked degree and the analysis would indicate a higher feeding value than corn or sorghum alone. Early varieties of beans are sown when the crop is to be harvested as silage, as they are more nearly mature at the time the corn is ready to cut and the vine growth does not interfere so seriously in removing the crop from the field.

Table 6 gives the analysis of a single sample of corn-and-velvet-bean silage as compared with analyses of corn silage and sorghum silage.

TABLE 6.—*Analyses of corn-and-velvet-bean silage as compared with silage made from corn and from sorghum.*

Kind of silage.	Number of analyses.	Constituents.					
		Water.	Ash.	Crude protein.	Carbohydrates.		Fat.
					Crude fiber.	Nitrogen free extract.	
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Corn and velvet beans [1]	1	73.7	1.0	3.5	5.5	15.6	0.7
Corn [2] (well matured)	121	73.7	1.7	2.1	6.3	15.4	.8
Sorghum [2]	30	77.2	1.6	1.5	6.9	11.9	.9

[1] Analyzed by the Bureau of Chemistry, U. S. Department of Agriculture.

[2] Analyses from Henry and Morrison.

Table 6 shows the analysis of corn-and-velvet-bean silage to be very similar to corn silage and sorghum silage except that there is a very marked difference in the quantity of crude protein. The crude-protein content is more than double that of sorghum silage and nearly double that of corn silage. The crude-fiber content is also very low and is less than that of either sorghum or corn silage. The analysis would indicate a higher feeding value for corn-and-velvet-bean silage than corn or sorghum silage alone.

Japanese cane has been used to some extent as a silage crop because of its heavy yields, but it has not been generally satisfactory. This crop bears no grain and the silage is low in crude-protein content and somewhat high in fiber content. The silage is usually of poor quality and not equal to corn or sorghum silage in feeding value.

RECOMMENDATIONS FOR WINTER FEEDING.

Roughages should be used to the fullest extent as winter feed. Provision must be made for feeding at least 3 months and the use of large quantities of roughage is the most economical method of wintering cattle. Every effort should be made to increase the production of forage crops, especially the legume hays and silage crops. To save roughages properly in that region, where summer rains are frequent and the moist atmosphere favors rapid spoiling in the field, more attention must be given to storing under cover. Sufficient mow space should be provided in barns to store all hays.

Silage may be made largely regardless of any weather conditions. Practically the entire feeding value of a plant is utilized when stored in the silo; this is a particular advantage with corn, which is the most reliable silage crop grown in the Piney Woods.

Corn is cut for silage at a time when the plant has the highest feeding value. In the case of the rank-growing southern varieties of corn about half of the feeding value of the plant is left after the ear is removed. When fed as silage the entire plant is consumed without waste, but if the ear is snapped and the stalks left in the field the sustenance leaches away rapidly, much of the feed is trampled down, and only a small percentage of the feeding value is utilized. Cutting the corn and curing into stover give uncertain results unless it is protected from the weather.

Corn and velvet beans make the greatest tonnage per acre of all silage crops grown in the Piney Woods and the silage has a very high feeding value due to the high protein content. The difficulty of harvesting the crop because of the heavy vine growth is the only obstacle to the general use of velvet beans as silage.

Where lumber is so plentiful a silo should be on every farm where cattle are raised, but on inquiry of all owners of pure-bred bulls, so far as lists are available, it was found that less than 1 per cent were using silos. The silo is a most valuable piece of equipment for the cattle farm and should be constructed even before cattle are purchased.

Velvet beans, in view of their adaptation to the region and the enormous quantity produced, should be the chief concentrated feed used. The value of this feed is not fully appreciated and a large proportion of the total acreage is now being used as pasture in a wasteful manner. Inquiry in every county of the Piney Woods brought out the fact that it is almost a universal practice to pasture all beans used as feed on the farm where grown. Most farmers provide no other feed for wintering cattle and many men use velvet-bean pasture in preference to silos.

Velvet beans in the pod are equal in feeding value to wheat bran and have about half the value of high-grade cottonseed meal. Certainly no farmer would allow his breeding cattle to run to the bin and eat their fill of bran or cottonseed meal. Turning stock cattle on bean fields means practically the same thing as giving them a fattening ration of a protein feed instead of a maintenance ration.

It must also be borne in mind that the grazing is the best when the cattle are first turned on the pasture and gradually dwindles to nothing. This condition is always true in grazing velvet beans and is the opposite of what it should be for fattening cattle. For maintaining cattle the ration should be constant, with a limited quantity of concentrate and all the roughage they will eat.

In an experiment at Collins, Miss., which has been previously mentioned, 78 head of mature cattle exhausted a 40-acre field of velvet beans in 28 days. It is evident that no measure of the yield of beans could be taken, but the estimated average of 500 pounds per acre was below the estimate of farmers accustomed to having beans picked from the field by the hundredweight. With an average of 500 pounds to the acre this field contained 20,000 pounds of beans, and if the beans were all consumed without waste the average daily ration of beans was 9.1 pounds a head. This ration was about right for fattening cattle but was excessive for breeding cows, and the cows made an average daily gain of 1.25 pounds a head. From this experiment conclusions were drawn as follows:

> In view of the scarcity of labor and the high cost of picking beans the pasture furnished economical feed for fattening cattle. However, it would not appear profitable to turn stock cattle on velvet-bean fields yielding more than 500 pounds an acre unless they could be allowed to run on the field a short period each day, as the beans would be less efficiently used than if picked and hand fed.

Where beans make a heavy yield, stock cattle should be turned on the field only 1 or 2 hours each day, depending on the ease with which the cattle can get a fill of beans. Late in winter and in spring the bean leaves and stalks do not supply roughage enough and some other roughage, such as the grass remaining on the range, should be fed as a filler. A reserve supply of beans should be picked to feed when the bean pastures fail, which usually happens when the cows are heavy with calf and need feed the most.

Velvet-bean pasture may be used economically for fattening cattle, but steers should be removed when the pastures begin to fail, and should be kept on heavy feed until finished for market, leaving the remaining beans in the field to be cleaned up by stock cattle.

The only method of completely utilizing the velvet-bean crop for winter feed is to ensile it. This clears the field in time to plant a cover crop of rye for winter and spring grazing; the carrying capacity of a given acreage in feed crops may be doubled or trebled in this manner. By planting the early maturing varieties of beans which do not make a heavy vine growth the crop may be handled for silage without excessive labor.

The velvet bean is so valuable as a feed that it should be utilized to the fullest extent. Production of the bean crop at a very low cost does not affect its value as a feed after it is produced and is not a logical reason for using it in a wasteful manner.

Cottonseed meal should not be used as fertilizer until it has been fed to cattle. Enormous quantities of cottonseed meal are used in the Piney Woods as a direct fertilizer when it could be fed to cattle and fully 75 per cent of the fertilizing value recovered and applied to the land in the form of manure.

BUILDINGS AND SHELTER.

Because of the short, mild winters cattle need little shelter and no expensive buildings are necessary. Cattle seek protection only from the cold winter rains of December, January, and February and a dry place to lie down is all that is needed. Mature cattle should not be closely housed and cattle space under barns should be boarded up only on the side of the prevailing winds.

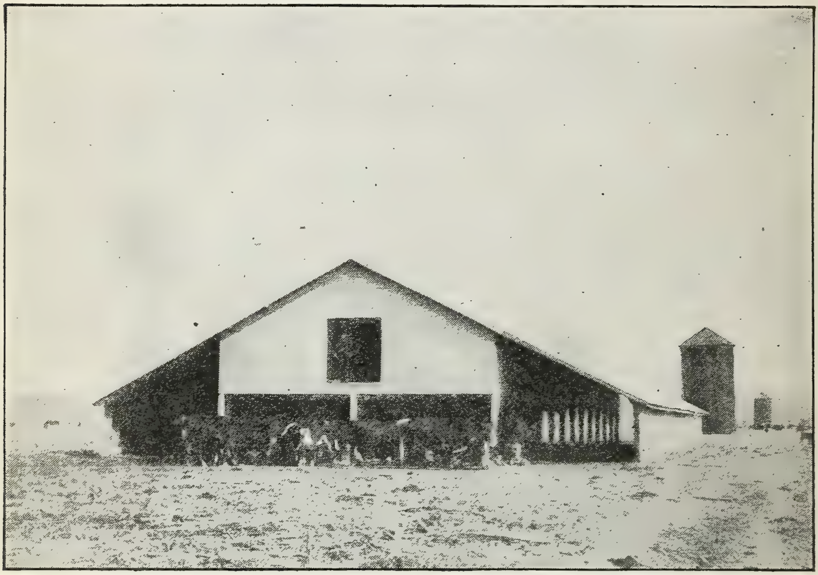

FIG. 11.—An open shed for cattle on a Louisiana ranch.

Where the land is not heavy enough to be injured by trampling, cattle will do better if allowed to run in the open with available shelter when needed. Where velvet beans are pastured during winter, shelter should be provided, as exposure to cold rains causes the rapid loss of expensive gains.

Figure 11 shows an inexpensive type of open shed used on a Louisiana cattle ranch. Such a shed provides all the shelter necessary.

In the Piney Woods region, where rains make the curing of hay difficult, barns should have ample storage space to take care of roughage for winter feed. Although lumber is plentiful, barns commonly follow the sawmill or cotton-gin style of construction and provide little mow space except for baled hay. Figure 12 shows a barn of the hip-roof or truss-frame method of construction on a cattle ranch in Mississippi. This is an inexpensive type of cattle barn which has a large storage space for loose hay. Working plans for constructing the barn may be obtained on application.

DISEASES AND PESTS.

The cattle tick (*Margaropus annulatus*), which is the carrier of the disease known as Texas or splenetic fever, is the only pest that has been a real detriment to the development of the cattle industry of the Piney Woods region. The native cattle become immune from the disease through contracting it in a mild form as calves, but mature animals brought in from Northern States or tick-free territory are very susceptible. The disease appears in from 13 to 90 days after exposure and is fatal in 90 per cent of the cases in mature susceptible cattle. The damage done consists of the loss of animals from the fever, the extra feed needed to support the blood-sucking parasites, the penalty placed on quarantined cattle at the markets, and the prevention of the bringing in of pure-bred animals for improvement of the herd. The total damage has been beyond reasonable estimate. In 1906 the Federal Government and State and local authorities began the systematic eradication of the tick and great progress has been made in recent years. The entire States of Mississippi and South Carolina are now released from

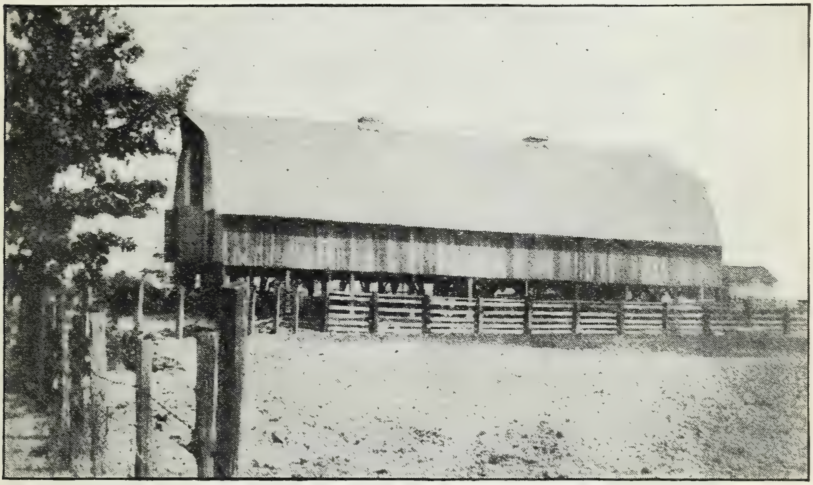

FIG. 12.—Modern cattle barn on the experiment farm at Collins, Miss. With the exception of the roof this barn was constructed of used lumber from abandoned "dummy-line" trestles and mill timbers. Note the storage room above and the daylight underneath.

quarantine and the States of Louisiana, Alabama, Georgia, Arkansas, and Texas have compulsory State-wide dipping laws in effect. It is expected that the Texas-fever tick will be entirely banished from this region by 1923. Cattlemen contemplating the purchase or lease of lands should be familiar with prevailing conditions. Many local areas and counties are being released from quarantine from time to time and anyone contemplating the movement of cattle into the Piney Woods region should write to the Chief of the Bureau of Animal Industry, Department of Agriculture, Washington, D. C., for the latest regulations defining the territory.

Mosquitoes and flies, which are often given as a serious objection to cattle raising, are not of any considerable economic importance in the Piney Woods region.

Screw worms are prevalent in the western portion of the region, but the damage is avoided by dehorning and castrating animals in cool weather, when the flies are not active.

Anthrax or charbon is not prevalent, although it is known to occur. Regions which are low and swampy are much more subject to this disease than the dry, sandy pine lands. The disease may be prevented by vaccination.

Blackleg occurs, but is no more prevalent than in other sections of the country. As a precaution young cattle should be vaccinated each year.

Tuberculosis is a disease practically unknown among the native cattle. This is no doubt due to the hardiness of the animals and the lack of close housing. With the eradication of the cattle tick there is no disease or pest that can be termed an economic barrier to beef-cattle production. Although the common diseases to which cattle are subject are present they are no more prevalent than in other regions, and the native cattle are subject to tuberculosis in a markedly less degree than northern cattle.

In purchasing northern cattle for breeding purposes extreme care should be taken not to introduce tuberculosis into the herd. Regulations require the testing of cattle for interstate shipment, and cattle should be purchased subject to retest.

WATER SUPPLY.

Next to abundant pasture an abundant supply of water is an indispensable feature of desirable cattle range. Water must be had at any cost, and where the supply is not dependable from year to year the cost of deep wells is well-nigh prohibitive for the man with a small number of cattle.

The natural water supply of the Piney Woods region is very abundant. The heavy rainfall supplies many springs, which furnish a constant supply of running water in practically all pastures. Where the surface supply of water is not constant, an ample supply of water may be obtained from wells at a depth of from 30 to 50 feet. In many places flowing artesian wells may be obtained, but at a greater cost than wells which strike the water table only.

Although most of the Piney Woods region is well watered, many pastures are supplied by water holes only at the time when the pasture is at its worst. These water holes usually have a heavy clay bottom and should be enlarged into ponds deep enough to prevent the cattle from fouling them by standing in the water, and large enough to hold water for any emergency.

In the flatwoods and sandy sections wells and storage tanks should be provided to prevent cattle from going long distances to water.

MARKETS.

The cut-over pine lands of the South naturally do not have great cattle markets such as have been built up in cattle-producing sections. As one lumberman expressed it: "We would not build our sawmills and wait for the timber to grow and we can not expect to have big packing plants until we raise the cattle." Many small plants are operating, however, and the large packing-house companies are enlarging their establishments at the southern markets in anticipation of the eradication of the cattle tick.

Some cattle are shipped from South Carolina and Georgia to Richmond and Baltimore, but most of the cattle from Florida and southern Georgia go to the Jacksonville market. Some Florida cattle are still exported to Cuba from Tampa. Most fat cattle from Alabama, Mississippi, and Louisiana go to the St. Louis, New Orleans, and Fort Worth markets. Packing plants at Jacksonville and Chipley, Fla.; Moultrie and Macon, Ga.; Andalusia, Mobile, and Birmingham, Ala.; Natchez and Vicksburg, Miss.; and New Orleans and Baton Rouge, La., are having a stimulating effect on the cattle industry of the region.

The Piney Woods region is well supplied with means of transportation. Lumber operations on a large scale necessitated the building of many railroad lines which interlace the whole territory, and it is not necessary to make long drives to a shipping point in any section. Moreover, bad wagon roads make it a distinct advantage to market home-grown feeds through cattle.

Figure 13 shows the distance to the principal markets from a central point in the cut-over region and the location of packing plants under Federal inspection.

EXPERIMENTAL WORK OF IMMEDIATE IMPORTANCE.

The changes and developments in the beef-cattle industry of the Piney Woods are so recent and unexpected that very few improved methods of management have been applied even in a particular locality. Practically no cattle farms or ranches have been established long enough to be pointed out as practical demonstrations. The question, "How long have you used a pure-bred bull?" was asked of every owner of a pure-bred bull in the Piney Woods, so far as lists were obtainable, and the average length of time given in the answers was less than 4 years. Four years is hardly time enough to put a cattle farm on a paying basis.

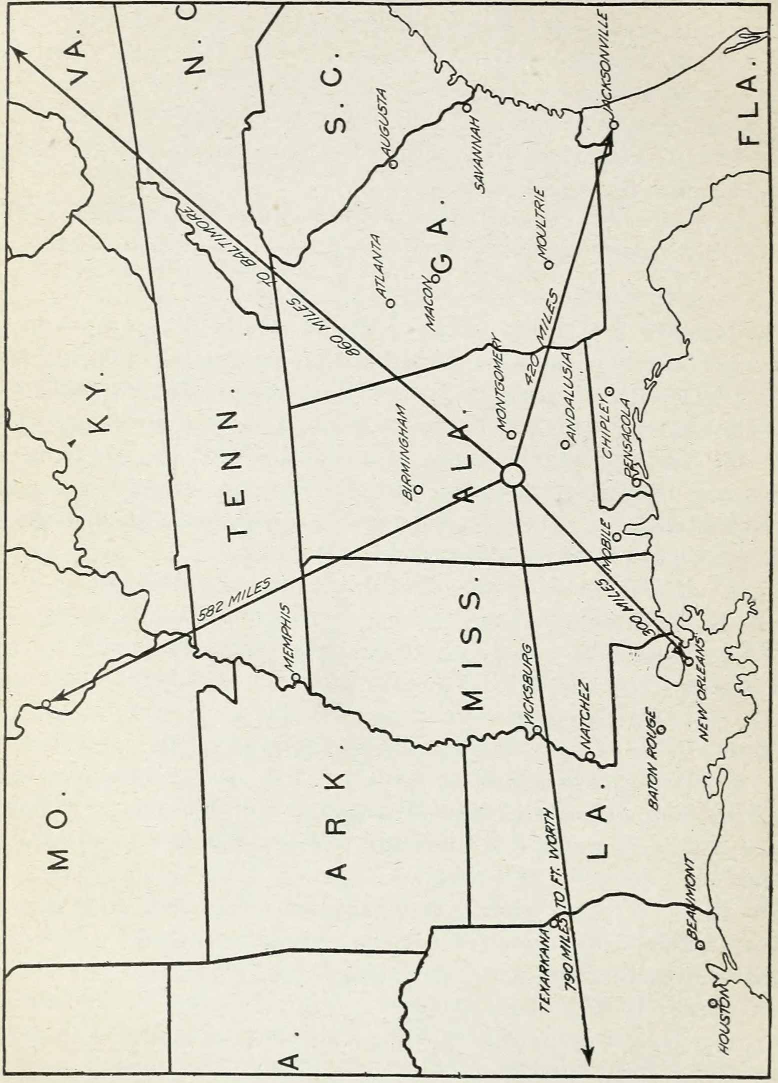

FIG. 13.—Location of principal southeastern markets and packing plants.

The crop rotations are not limited to corn, oats, wheat, and clover, or similar rotations, as is common in most cattle-producing sections, where certain general practices become well established. So great a variety of feed and forage crops is grown that men on adjoining farms may follow different methods in the management of their cattle, each advocating his method as the best. Therefore the demand for definite information concerning the region is insistent.

In answer to questionnaires 51 per cent of the lumbermen who did not already own cattle stated they were interested in the purchase of cattle to put on their lands. In entering the cattle business in this region, however, each man has to do his own experimental work according to his individual needs, because of the lack of any other source of information. Such information as the private owner may obtain, even though it is accurately recorded, is not available to the public and its value is lost. Many problems must be worked out locally by the individual, but such problems as the improvement of the pastures and the utilization of velvet beans are of such general importance that immediate experimental work is imperative. Other problems necessarily are connected and should be worked out at the same time.

Pasture problems involve the practical application of the present agronomic knowledge of the pasture plants adapted to the Piney Woods. Accurate data are needed concerning the relative merits of these plants as determined by methods of establishment, cost of establishment, ease of maintenance, and productive value when grown on a scale sufficient for the commercial production of cattle. Methods must be worked out to protect the desirable pasture plants now found on the range, and to facilitate their reseeding and natural spread so that wire grass and broom sedge may be replaced.

Feeding problems involve the use of home-grown feeds for wintering cattle and fattening for market. The economical use of velvet beans, silage, and legume hays is of particular importance.

The problems of herd management under Piney Woods conditions involve systems of breeding, handling the herd, methods of summering and wintering, prevention of disease, and marketing, on all of which accurate data must be obtained before the business in that section can be conducted on a safe basis.

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